THE GARDEN JOURNAL

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THE NEW YORK BOTANICAL GARDEN

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THE GARDEN JOURNAL

DOROTHY EBEL HANSELL, *Editor*

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TREES, SHRUBS, AND ARCHITECTURE

By ROBERT L. BAKER

Dr. Baker is Assistant Professor in the Department of Horticulture, University of Maryland. This article is the result of observations made while teaching the course in "Woody Plant Materials" at the University. For a number of years, he has been interested in American decorative arts and architecture—in fact, after being graduated from Swarthmore College, he almost entered this field instead of botany. But he continued graduate studies in the latter subject, receiving his doctorate early last year.

AS AN AMATEUR STUDENT of architecture and a professional botanist, I have derived great enjoyment from visual studies of forms and textures of buildings and of trees and shrubs. It is even more interesting to consider the similarities which exist between the forms and textures in vegetation and in architecture. Observation of the surfaces and textural qualities of building materials has led me to notice similar variations in surfaces and textures of plant materials, especially when thinking of them as elements in an over-all landscape design. From this I have become more aware of the harmonious or contrasting relationships which may be found wherever plant materials are combined with architectural materials.

As a botanist I tend to notice first morphological details—leaf and flower or fruit structure, branching habit, bark, and other identifying features of the particular plant species. However, interesting as these plant characteristics may be to the botanist, he must also see trees and shrubs in the more abstract terms of line and mass in order to appreciate their larger role as elements in a landscape design. From this point of view the species of tree becomes less important than its form, since many species may have the same form and thus produce the

In summer the cutleaf Japanese maple is a mass of filmy foliage.

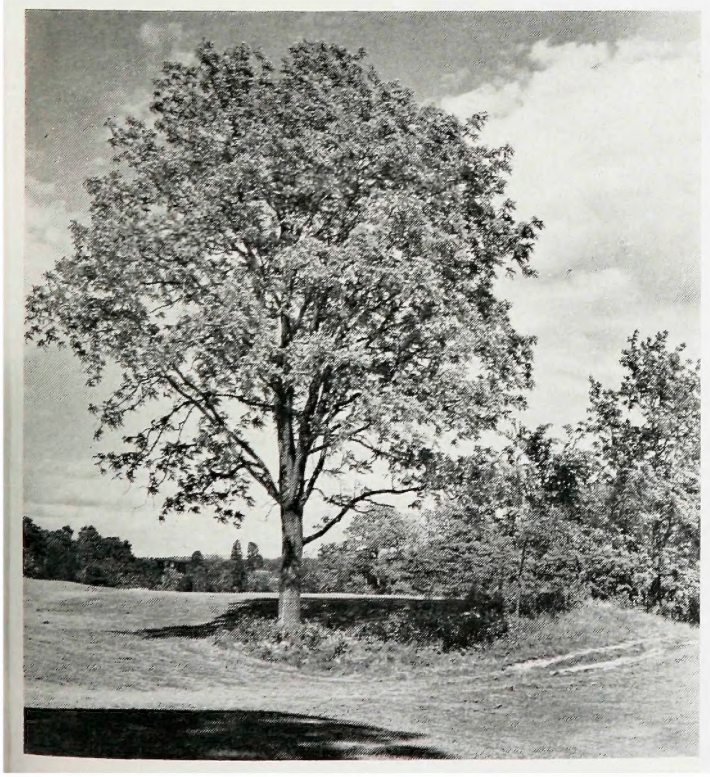
Revealed in winter, the gnarled trunk and branches of the Japanese maple become striking features of the landscape.

The mass of a plant, whether it is open or dense in appearance, depends upon the number and placement of twigs and leaves. The Kentucky coffee tree, *Gymnocladus dioica*, is an example of "open" habit of growth.

same effect in a landscape design.

Before describing some effective combinations of vegetation and architecture, I should emphasize that they result from similarities or contrasts in *form, mass, texture,* and *color*. Clear parallels exist between textural qualities of building materials and of plants, and between the overall forms and masses of buildings and of plants. Combinations of textures and forms are utilized in architecture and landscape design. An appreciation of the relationships between these aspects of architecture and vegetation leads to a greater awareness of the possibilities for successful combinations of the two. The landscape architect with a good knowledge of plants is aware of their architectural qualities and may create imaginative compositions by selecting those plants which are uniquely suited to a particular building and site.

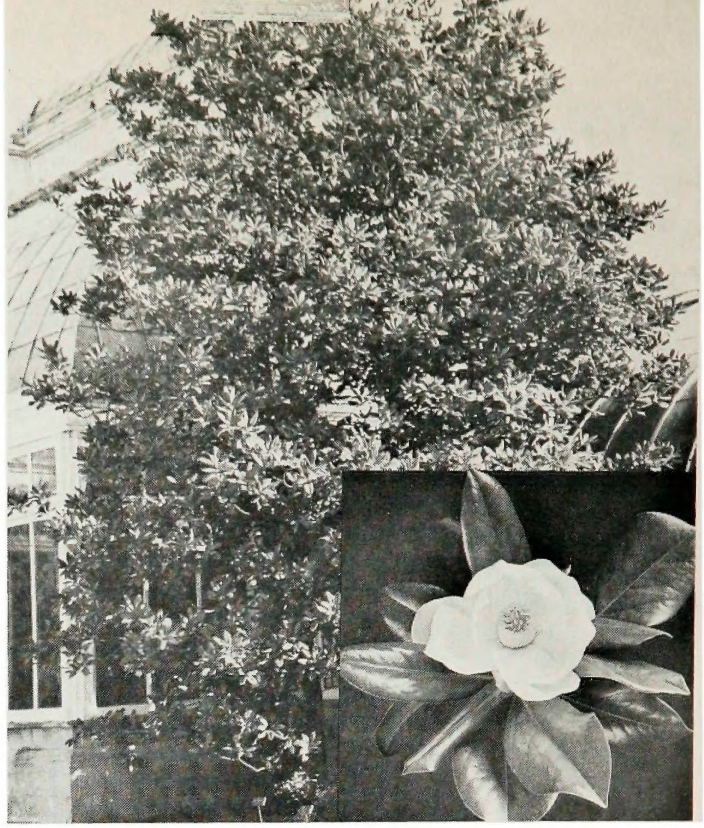
The relatively wide spacing of the leaves of the black walnut, *Juglans nigra*, allows light to penetrate. This tree also has an "open" habit, especially noticeable in winter (right).



It is instructive to consider some of the parallels between architectural forms and the forms of trees and shrubs. In the past we were able to think of traditional architecture rather simply in terms of horizontal or vertical emphases, with the possible exception of domed or circular structures. The advent of new building materials and techniques in the late nineteenth and the twentieth centuries created opportunities for startling innovations in architectural design, utilizing curvilinear or flaring forms which never before would have been possible. Although the basic outlines of contemporary buildings may still be horizontal or vertical, there now occurs a wide range of possibilities for variation within these outlines.

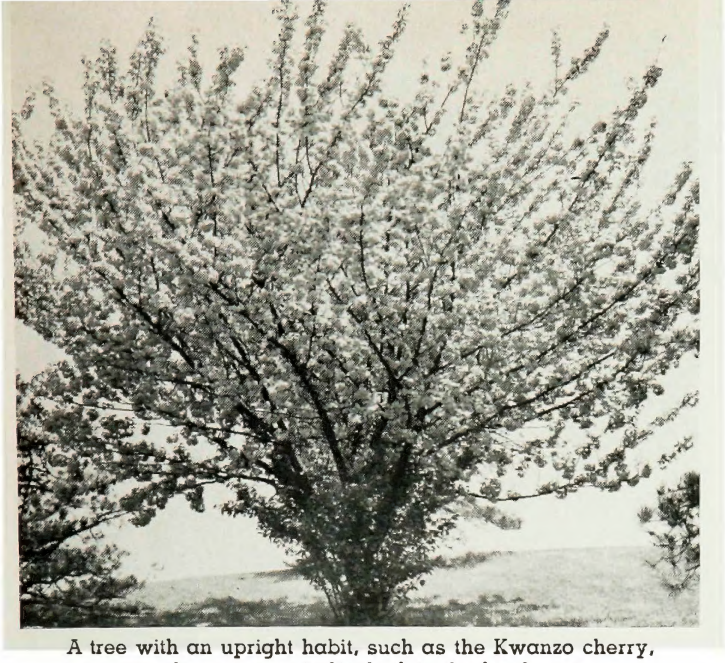
Very generally speaking, traditional architecture tended to be rather massive in its visual effect, although this could be reduced by treatment of surface decoration and color to produce a lighter feeling. Even so, the limits of the building were clearly defined and it stood apart from the landscape as a distinct entity. By contrast, in many contemporary designs the distinction between interior and exterior space becomes very subtle or even nonexistent. Such features as the use of cantilevers, extensive areas of glass curtain walls, and the placing of tall buildings on "stilts" have created structures which are quite literally airy and lack the visual weight inherent in traditional construction technique. When comparing recent developments in architectural forms with the structural forms of trees, we realize that all the architectural forms, from massive blocks to domes and spires and the "in-out" spaces of modern design, may be found repeated in the forms of certain trees and shrubs.

The departure from traditional architectural design and materials has resulted in the production of "organic" buildings which are closely integrated with their natural environment, and also of structures which by their form and use of such materials as glass, aluminum, and enamel panels stand in contrast to a natural setting but are well suited to the man-made cityscape. Both types of buildings offer great potential for interesting uses of plant textures and forms. The choice and placement of plants around a building in a natural setting may either perfect or ruin its total visual effect when seen from a distance as a composition in line and mass. Upon closer inspection, the right combinations of plant and building textures and lines may provide a visually satisfying experience for the observer. Unfortunately, we are too often left with an impression of complete indifference or even subconscious depression because of the mediocrity of design of building and landscape. Even assuming a unified design in terms of line or mass, the combinations of building surfaces and plant textures may lack interest due to the absence of contrasting elements—the surprising or unexpected features which create visual interest in a composition. In architecture contrasts of light and shadow or projections and recesses which articulate the surface of a facade relieve a sterile monotony of surface. Similarly, contrasting elements in details of form, texture, and color enliven a landscape design and may also apply in combinations of plant and



The large, overlapping leaves of the southern magnolia, *M. grandiflora*, create an effect of density or solidity, appropriate to buildings of traditional design. Insert, close-up of flower and leaf.

Horizontal lines in architecture are repeated in certain small flowering trees such as the mimosa, *Albizzia julibrissin*. Insert, close-up of flower and foliage.



A tree with an upright habit, such as the Kwanzo cherry, stands out as an individual in the landscape.

building materials. At the other extreme, a good design may be ruined by excessive and unrelated contrasts of form, texture, or color. The effectiveness of accents or contrasting elements presupposes an underlying unity of forms and/or textures.

Except in general terms it is not possible to define what constitutes "good" or "bad" combinations of plant and architectural elements. Each design must be considered on its own. However, an awareness of the architectural forms and textures of plants can help in the selection of plants best suited to a particular building by virtue of their contrasting or harmonious elements.

The natural architectural form of trees and shrubs may be observed both in the external outline of the whole plant and in the internal arrangement of trunk and branches. A closely related factor, the mass of the plant—whether it is open or dense in appearance—is dependent upon the number and placement of twigs and leaves on the branches. Plants such as *Franklinia, Nandina,* black walnut *(Juglans nigra),* and Kentucky coffeetree *(Gymnocladus dioica)* may be described as having an "open" habit because of the limited number of lateral branches or twiggy growth and the relatively wide spacing of leaves which allow for penetration of light through the plant. Other plants produce an effect of great density or solidity because of the large number of overlapping leaves, as in copper beech, horse-chestnut, and southern magnolia *(M. grandiflora)* or to many short twigs, as in hardy orange *(Poncirus trifoliata)* and the hawthorns which do not allow penetration of light through the foliage. Within each of the different forms of woody plants occurs a range from open to dense mass.

The arrangement of trunk and branches of deciduous trees and shrubs, often obscured during the summer, may become a feature of great beauty in the winter landscape. Notable examples are the gnarled trunk and branches of the cutleaf Japanese maple and the smooth, gray trunk of the beeches. The tree, seen in summer as a mass of foliage, is now revealed in its skeletal framework of ascending, horizontal, or pendulous branches which produce new patterns as outlines against the sky or as shadows cast on the ground.

Although each species has its own characteristic habit of growth, there are generalized forms or outlines of trees and shrubs which have a striking correspondence to architectural forms. Effective compositions may be created by using these plants to repeat architectural forms or by using contrasting plant forms as accents:

1. Plants having a rounded, mound, or domelike outline comprise one of the major architectural forms of vegetation. Trees or shrubs with low branches and foliage at the ground level produce an effect of great visual weight. Large trees with this habit of growth, such as southern magnolia and copper and fernleaf beech, with a dense, massive appearance are well suited to massive buildings of traditional design, but would not be appropriate with the light, airy buildings of contemporary design. Such plants may be very effectively used in groups, since their branches tend to merge with each other and with surrounding vegetation on the ground. Other plants of this type are the English box, thorny eleagnus, many rhododendrons, Heller's holly, and pendent silver linden. Trees with pendulous branches touching the ground produce a similar effect, such as the weeping cherry, weeping willow, and weeping beech.

2. In contrast to moundlike trees with low, sweeping branches are those with a single trunk and ascending branches which fan out from a common point in a "vase-shape" pattern. The best example is the American

The weeping cherry, *Prunus subhirtella pendula,* with its low, hanging branches, appears to merge with surrounding vegetation on the ground.

elm, but a few other trees such as *Zelkova* and silver maple also exhibit this habit. Some shrubs have ascending branches and a spreading crown, such as witch-hazel, crape-myrtle *(Lagerstroemia),* and certain honeysuckles.

3. However, the majority of our common trees have neither low, sweeping branches nor a vase-shape crown; they generally have a single trunk with a rounded, spreading crown, such as tulip-poplar *(Liriodendron tulipifera)* and the oaks, or a more narrow, oblong crown as in the persimmon, sassafras, sourwood *(Oxydendrum arboreum),* and sweetbay *(Magnolia virginiana).* Such trees with a trunk and crown of branches and foliage cannot be as effectively massed as the low-branching trees. They stand apart from the ground with a distinct visual break between ground and foliage.

4. The trees which stand out as individuals most prominently in the landscape are those with a symmetrical conical or fastigiate habit. Trees having a single trunk and a regular arrangement of branches with a pyramidal outline include the majority of North American conifers, such as the hemlocks, firs, and spruces. Some conifers have a narrow spirelike form such as the incense-cedar *(Libocedrus decurrens),* pond-cypress *(Taxodium ascendens),* and certain junipers and cypresses *(Cupressus).* Other plants have an upright or fastigiate habit with many ascending branches often without a single trunk throughout. Examples are the upright English oak, Lombardy poplar. Kwanzan cherry, and Irish yew. Conical and fastigiate plants are always prominent features and are difficult to integrate with other plantings. Conifers were popular landscape plants in the Victorian period; certainly their spirelike forms blended well with the vertical lines of turreted Gothic Revival buildings. In the present day they may serve very effectively as foils to buildings with strong horizontal lines or as accents in predominantly flat landscapes. In any case, they are probably best planted in groups or groves rather than as single specimens, except in a rigidly formal design.

5. Trees and shrubs having a spreading, flattened crown with tiers of horizontal branches resemble much of contemporary architecture with its horizontal lines and in the penetration of space through this form. Mature specimens of cedars *(Cedrus)* and many pines exemplify this type of growth. Perhaps the best example of a shrub in tnis category is the doublefile viburnum, which has layered horizontal branches notable in the spring and fall when flowers and fruit are borne on the upper surface. Repetition of horizontal lines in architecture may also be observed in small trees such as the flowering and Chinese dogwoods, Japanese maple, mimosa *(Albizzia julibrissin),* hornbeam *(Carpinus caroliniana),* and Yoshino cherry. Often seen in southern Europe, the flat-topped stone pine and the columnar Italian cypress create an interesting juxtaposition of contrasting forms. On a smaller scale, low-growing shrubs with prostrate branches, such as many junipers and cotoneasters, may be used to extend the horizontal lines of a building. When planted at the top of a low wall and allowed to grow over the edge, they assume a pendulous habit and function as vertical accents on the wall.

6. Many trees with a highly irregular or picturesque form are also relatively open in mass and show a relationship to the "in-out" spaces of contemporary architecture. Asymmetry of form may be a natural characteristic of the species, as in young ginkgo trees and old specimens of sour gum *(Nyssa sylvatica)* and persimmon, or it may result from disease, injury, or adverse growing conditions, as has happened with Monterey cypresses growing on the windswept California coast.

The distinction between indoor and outdoor space may truly disappear when the structural materials of the building are extended beyond its outer walls as terraces or retaining walls. The same forms may be extended in vegetation by utilizing similar natural forms or by shearing or training plants into appropriate shapes. Furthermore, sheared hedges may appear and function as walls, or masonry walls covered with the foliage of vines or shrubs may resemble hedges. The visual effects are identical and each serves to define a space. The most psychologically effective gardens are those designed on a human scale which comprise a distinct enclosure, an "outdoor room" with sheltering walls and canopy of vegetation. Gardens designed on a far larger scale also utilize hedges in the creation of allées and vistas. Fifteen- or twenty-foot hedges of hornbean or beech are encountered in the great gardens of Europe. Topiary specimens or hedges sheared into highly artificial forms may serve as sculptural accents in the landscape by their very nature, or they may repeat architectural details of adjacent buildings. Three examples from English gardens are cited. A very pleasing effect is seen in the famous garden of Ann Hathaway's cottage near Stratford-on-Avon; here the hawthorn hedge and several shrubs close to the house are sheared into rounded, irregular forms which subtly repeat the rounded lines of the thatched roof and the irregular lines of the house itself. At Levens Hall the top of a high yew hedge near the house is sheared into the same crenelated pattern that appears on the tower above the hedge. Similarly, in the garden at Nymans, a yew hedge adjoining the stone walls of a fire-gutted Gothic building has been developed with a series of pyramidal peaks which show a close relationship to the traceries and pinnacles of the ruined building.

To be continued.

". . . Natural beauty is a treasure jointly owned by all citizens and therefore it is the responsibility of all. Natural beauty can only be conserved, or enhanced by planting greenery. It can be destroyed by unwise or thoughtless actions which have led to much of the creeping ugliness of today. Ugliness is waste. It costs less and produces more to plan for beauty than to allow ugliness to grow. People feel better, look better and act better in a more beautiful environment.

"People and trees and shrubs shoud be inseparable in planning to overcome the ugliness of many cities and towns."

PLANTING NEWS

Sinningia "Emperor Frederic'.

Alloplectus schlimii.

Achimenes patens major.

GESNERIADS

By WALTER SINGER

Mr. Singer is Staff Photographer of The New York Botanical Garden.

LITTLE DID DR. GESNER, Swiss physician and botanist, surmise how often his name would be mentioned, in connection with popular house plants, some four hundred years after he had introduced the genus *Gesneria*.

Gesneriads had been known to the plant collector and commercial plantsman for a long time. Linnaeus cited them in the eighteenth century, and in the middle of the nineteenth century gloxinias, achimenes, and streptocarpus were favorites with growers of pot plants in Europe. Then after a period during which their popularity rose and fell, there was a noticeable upsurge in the demand for gesneriads in the United States and it soon spread around the world. This intense interest was probably triggered by the popularity of the African violet—as a matter of fact, the amateur plantsman calls almost all gesneriads African violets or speaks of them simply as "cousins." Episcias, for example, are called flame violets.

Botanists, however, cannot take such an easy way out of a confusing situation, and in recent years have been engaged in reclassifying this group of plants. It has not been an easy task, for in recent literature "miscellaneous gesneriads" are listed, indicating that some have so far resisted classification.

Although some gesneriads require individual treatment, the majority will do well in the home under more or less similar growing conditions. These conditions are rather like the atmospheric condition to be found in the living room where a night temperature of 60° to 65° is maintained, with a rise of ten degrees during the day. While some members of the *Gesneriaceae* may survive lower or higher temperatures, the above range has proved to be the most suitable. Episcias may suffer if the temperature falls to 50° at night; on the other hand, achimenes and some varieties of streptocarpus will do better between 50° and 55° at night.

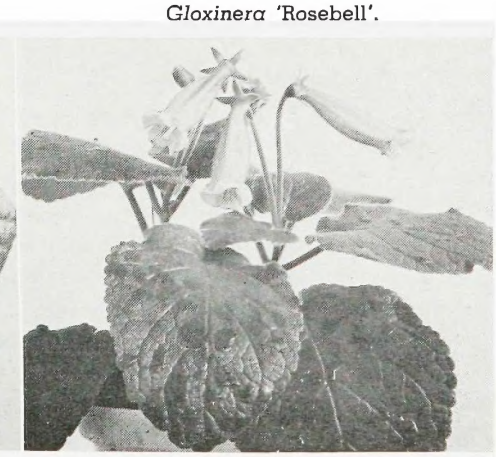
Because of their tender foliage, gesneriads are grown in diffused or filtered light. Direct sun, especially during the middle of hot summer days, causes burn and discoloration. At that time of year a north or northwest window is preferable; in early spring, late fall, and winter, an east or southeast window is better.

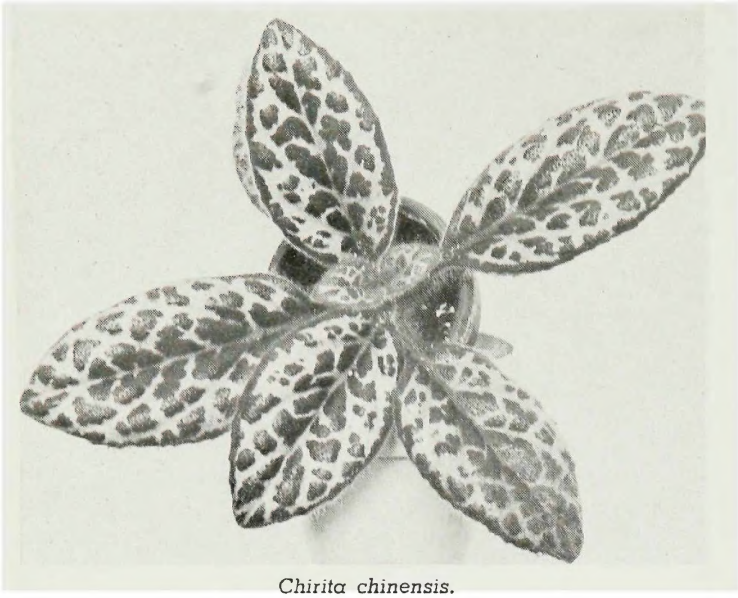
Diffused light and light shade are desirable but should not lead to darkness. African violets, for instance, should receive light equivalent to at least 1,100-foot

Smithiana zebrina discolor.

Saintpaulia 'Pink Cushion'.

Gloxinera 'Rosebell'.





Chirita chinensis.

candles—1,600 is the optimum of natural or artificial light—if they are expected to flower profusely.

Growing gesneriads under artificial lighting—in a combination of fluorescent and incandescent lights with an intensity of 1,600-foot candles for fourteen to eighteen hours a day—has proved successful in getting these plants to flower freely.

Watering is an operation which must be done carefully, otherwise discoloration, such as ring spots on the foliage of African violets, will result. Water which is colder than room temperature may cause damage when it is splashed on warm leaves. When the leaves are washed and rinsed, the water should be of room temperature and the plants should not be in bright light until the leaf surfaces are fully dry.

Gesneriads grow well in a loose, well-drained soil rich in humus (leafmold). An occasional liquid feeding is beneficial.

Nearly all are natives of the Tropics, but a very few are hardy and can be found in northern regions.

Here is an interesting selection of these popular house plants.

Achimenes patens major, a native of Mexico, has large, purplish and rose-colored flowers. The name, derived from a Greek word, indicates that this plant suffers from heat. In the middle of the nineteenth century achimenes were widely grown because of their beautiful flowers; they were used as bedding plants in the garden during the summer months. They are easily propagated by divisions and cuttings of their rhizomes.

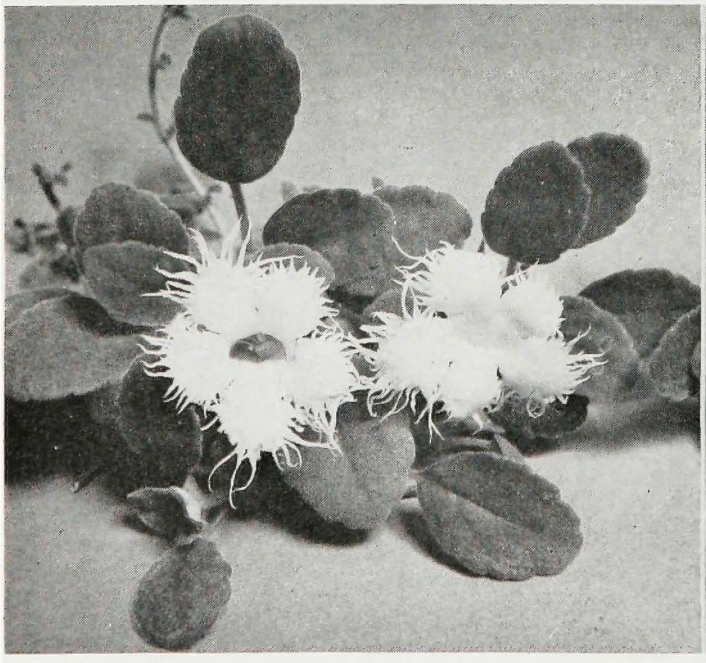
Aeschynanthus is a genus in the *Gesneriaceae* which has trailing and climbing varieties especially adaptable to hanging baskets, and they are easily propagated from cuttings. Among the popular species are *A. javanicus* and *A. lobbianus,* with scarlet flower buds resembling a lady's lipstick, hence the common name of lipstick plants. *A. marmoratus,* a trailing vine from Java and Siam, has very colorful leaves with a network of veins and a maroon underside.

The genus *Alloplectus* has representatives in the tropics of Central and South America; while most of them are upright, a few are epiphytic. *A. schlimii* from the Andes of Colombia has golden-yellow flowers with red lines. Tip cuttings root easily and make handsome plants in a relatively short time.

Chirita is a native of tropical East Asia; its name is thought to be Hindustani for gentian. *Chirita chinensis* has attractive leaves with silver variegation and thimble-like flowers of a violet color with prominent yellow anthers. This gesneriad is usually propagated from cuttings.

Episcias are often called the cousins of African violets or flame violets. The name derives from the Greek *episkios* meaning shady and refers to the natural habitat of these vines which are found from Brazil to the West Indies. While some are outstanding for their colorful foliage, others excel in delicate, colorful flowers. Two good examples are *Episcia cupreata* 'Acajou' with color-

Episcia dianthiflora.



Aeschynanthus marmoratus.

ful variegated foliage and brilliant scarlet flowers and *E. dianthiflora* with fringed, white flowers and smooth, velvety green leaves.

Gloxinera 'Rosebells' is one of the few bigeneric hybrids between a *Sinningia* and *Rechsteineria*. The rose-colored flowers resemble those of gloxinia, while the leaves are similar to those of the rechsteinerias. Tubers, available in the trade, are started in a mixture of peatmoss and sand in a 65°-70° temperature.

Rechsteineria leucotricha was named the Brazilian edelweiss by Alfred B. Graf who introduced the plant to the trade. Its silvery white, hairy leaves and stems certainly resemble those of the alpine plant. But the flowers of this tuberous-rooted plant should not in any way be under-rated. They are very attractive, their tubular corollas salmon-red and covered with silvery hairs.

Saintpaulia is the genus to which the African violets belong—and there are probably more African violets grown in the United States than anywhere else in the world. Since they grow well under fluorescent lights, it is possible to raise them in the basement of the home as well as in the living room. African violets are propagated from leaf cuttings. For large and well-flowered plants, it is advisable to grow them to a single crown.

Gloxinia has become a familiar name in the English language. But what the florist calls "gloxinia" is botanically *Sinningia,* named in honor of the horticulturist W. Sinning at the University of Bonn, Germany. Gloxinias are tuberous-rooted gesneriads, and they bear spectacular flowers. After flowering, gloxinias are rested by reducing the temperature to about 50° and witholding water. Gloxinias are grown from seeds and tubers.

Smithiantha was named in honor of a Miss Smith who was a plant and flower artist at Kew Gardens in England. Being natives of Mexico and South America, smithianthas require a warm and humid atmosphere. They can be raised from seeds or by dividing their fleshy rhizomes; some growers on the West Coast are selling such fleshy rhizomes now. In Europe, where smithianthas are quite popular, either rhizomes or seeds are readily available in the trade.

Episcia cupreata 'Acajou'.

Streptocarpus originates from the tropics of Africa. While wild species are grown only as novelties, many large-flowering hybrids are available in the trade. They are usually raised from seeds, but occasionally some are grown from leaf cuttings, especially when a certain strain is wanted. Sometimes the plants are rested and started over again in spring. Several very interesting species have giant-size leaves—often only a single leaf to a plant.

Rechsteineria leucotricha.

Streptocarpus 'Wiesmoor Hybrid'.

HENNA — ITS FRAGRANCE AND COLOR ARE AGELESS LURES

By EDWIN A. MENNINGER

Dr. Menninger, widely known as "The Flowering Tree Man," is the author of several books, the latest *Seaside Plants of the World.*

A SHRUB which has been a garden favorite for three thousand years must have exceptional merit. Such is the record of the henna plant *(Lawsonia inermis* L. = *L. alba* Lam.) which Solomon was lauding when he wrote, "My beloved is unto me as a cluster of camphire in the vineyards of Engedi."

Solomon, of course, cherished camphire for its delightful, penetrating fragrance which masked less desirable odors in the harem. But fragrance is only one of the good points about the henna plant that endear it to many.

Henna is native from northern Africa to Madagascar, and from Iran to India and Australia, but it is now cultivated or gone wild in all warm countries. In Egypt it is a crop; seedlings are transplanted into the field two feet apart, irrigated regularly, and the branch tips harvested twice a year for the leaves. The plant thrives about twelve years under this regimen, then it is cut off near the ground and allowed to grow anew.

Gardeners like henna because it makes a good hedge plant. It grows readily from seeds or cuttings, transplants easily, submits to many abuses including neglect, and the small, opposite, shining leaves respond well to shearing. Periodic pruning stimulates flower production. A thrifty plant bears resemblances to some forms of privet (*Ligustrum* sp.). The epithet *inermis* in the plant's scientific name means thornless; but sometimes in poor soil or under difficult growing conditions, spines do develop among the leaves on the branch tips. Henna will grow in very dry areas, though it becomes more luxuriant with ample moisture. It will even grow in salty soils where so many other plants fail.

The fragrance of the flowers makes the plant highly desirable to the perfume industry, and in the Near East it is utilized in embalming. The flowers, in dense, twelve-inch panicles at the tips of the branchlets, have four petals which ordinarily are greenish white, but sometimes these are bright, creamy white. A yellow form and a variety with cinnabar-red petals are known, and in Calcutta occurs a beautiful form with clear pink flowers. The eight stamens greatly exceed the petals in length and are the most conspicuous part of the flower. The flowers do not last long after being cut for bouquets.

The flowers are followed by quantities of round seed pods, the size of a pea, which weigh down the branch tips. These are first green, then red, finally dark brown, splitting open irregularly, as is often the case in the crape-myrtle family *(Lythraceae).* Sometimes the unopened seed pods persist on the plant until the next flowering period.

Henna is best known for the dye obtained from the leaves and used extensively in shampoos, rinses, brilliantines and the like to give the hair a rich auburn tint. In North Africa, Asia Minor, and India henna is used to dye the nails, the palms of the hands, and the soles of the feet an orange-red; this practice is supposed to make the women more beautiful. In some places, particularly Iran, this practice is not confined to women but is also followed by men. Henna is used in the Near East to dye the heads of children, the beards of men, and the manes and tails of horses. In dyeing beards, the henna rinse is followed by indigo, which turns the hair a beautiful jet black. Using henna to dye the nails is a very ancient custom, for Egyptian mummies were commonly thus beautified.

To make the dye, the dry leaves of the plant are pounded to powder, then mixed with a little hot water and some sticking agency, such as lime or catechu. This paste is applied to the part to be dyed and left overnight. The color lasts a long time.

For centuries medicine men have had a heydey with henna, using is as a remedy for everything from leprosy to rheumatism. For an array of these uses see Burkill: *Dictionary of the Economic Products of the Malay Peninsula.*

Religious uses of henna are many. Buddhists strew the flowers as offerings to their deities. The Jews have used them in baths and in other ceremonies.

Henna has many common names. In the Philippines it is called *cinamomo.* In the West Indies it is Jamaica

(Continued on page 27)

Henna, *Lawsonia inermis.*

EVOLUTION OF A TROPICAL NATIONAL PARK

By RUTH H. SMILEY

Mrs. (Keith) Smiley is an ardent naturalist, conservationist, and horticulturist, and lectures before gardening and nature organizations and school groups. Mrs. Smiley has lectured before The New York Botanical Garden and will do so again on May 7, 1966: her subject, "Tropical National Park, St. John." Her husband's interests include conservation and geology.

Special nature and garden programs, arranged by members of the Smiley family, are given throughout the season at the Lake Mohonk Mountain House and attract large audiences.

ONE OF THE MOST RECENT additions to the National Park System is a major portion of a small island in the Caribbean. It is located on one of the most southeasterly sizeable pieces of land in the United States possession.

The Virgin Island National Park encompasses about two thirds of the twenty-one-square-mile island of St. John, plus fifty-six hundred acres of offshore water, and submerged lands containing coral gardens. They are volcanic in origin, encircled by living and growing underwater reefs of coral. In 1956 through an Act of Congress these became part of the vast heritage of the American people. They now remain under the protection of the National Park Service of the United States Department of the Interior. Their purchase was made available largely through funds from the Jackson Hole Preserve Inc. This organization owes its existence to the efforts and contributions of conservation-minded Laurance S. Rockefeller.

There are approximately one thousand people living on St. John at present. However, with its beautiful coral-sand beaches and ideal climate, it is rapidly becoming a tourist objective. Its inaccessibility has added to its remoteness, but this may vanish with modern transportation. Availability of fresh water has always been a natural limiting factor to overpopulation of the Virgin Islands, but this problem could become obsolete in the future as desalinization of water becomes economically feasible. A small plant is already in operation at Caneel Bay.

Although the National Park Service seeks to insure protection of the scenic, scientific, and historic resources of this National Park, it is opening up this unique area to the public through a well-planned and gradual development program.

The colorful coral reefs have added an expanding dimension to the interest of this particular Park. Snorkeling has become a popular sport with the visitors. A whole new world of underwater life opens up to the masked explorer, who has the sensation of swimming in an aquarium among colorful fish and fantastic creatures. There is a self-guiding underwater trail at Trunk Bay, which has one of the loveliest beaches in the world. It never fails to amuse snorkelers to come upon the sign,

A veteran kapok tree, *Ceiba pentandra*, at Cinnamon Bay.

Trunk Bay, the site of the underwater nature trail.

ten to twelve feet underwater, indicating that this is part of the National Park Preserve. The Park naturalists hold scheduled snorkel expeditions where they point out and explain the wonders of the marine world.

There seems to be an excellent plan of development of facilities for visitors to the Park. For the more fashionably minded, there is the Caneel Bay establishment. It is located at the entrance to the Park not far from the main town of Cruz Bay.

Delightfully situated well within the Park boundaries and on a lovely beach are the Cinnamon Bay camp ground and beach shelters. This concession, which began operating in 1964 under excellent management, provides for those visitors who wish to live close to nature. A small, but well-stocked commisary caters to the campers, supplying them with a variety of necessities. There are approximately thirty-five tent sites and four units consisting of four shelters each. The screened beach shelters are the nearest thing that one can experience to camping without the inconveniences. A few other cottages are available for rent in other locations, and this about covers the island guest accommodations.

The best way, of course, to explore the island is on foot, and there are many good trails to places of interest. Only by this means can the native fauna and flora be truly seen and appreciated. However, it comes in handy to rent a Jeep for the farther places. Hiking in a tropical climate can be tiring, especially when the terrain is mountainous as on St. John.

The majority of plants and animals have been introduced on the island by means of water, wind, birds, and man. The flow of life has been from the south of the island, from places on the north coast of South America, rather than from the north.

A cottage unit, with outdoor fireplace at the edge of the beach, at Cinnamon Bay.

The inviting beach at Caneel Bay.

The climate is equable with a six-degree differential between summer and winter, the average annual temperature being about 79°.

All the virgin forest was removed when the land was cleared during the occupation by the Danish sugar plantations. The cover consists largely of tropical second growth of hardwoods and broad-leaved forests less than one hundred and fifty years old.

Over two hundred and fifty species of native trees and shrubs have been identified. Such plants as coconut, calabash, kapok, sea-grape, frangipani, and flamboyant grow in abundance. Along a trail above Cinnamon Bay is an excellent grove of bay trees, left from Danish times when bay rum was distilled from the leaves. Large specimens of cacti and century plants grow along the eastern end of the island.

In several swamps the mangrove has taken over and it is interesting to observe its growth. The fruit develops a seedling or "radical" while attached to the tree. When "ripe," the seedlings drop into the brackish water. They take root and in this way extend the forest beyond the parent plant, forming an impenetrable jungle.

There are over one hundred species of birds including herons, pelicans, frigate birds, and terns. The duck population varies, according to the amount of yearly rainfall. Among the land birds are the hummingbirds, three species of doves including the lovely moustached quail dove, and hawks. The colorful and ubiquitous bananaquit and the bothersome but amusing pearly-eyed thrasher or 'thrushie' are seen everywhere.

Of the larger animals only a few are native. The list includes several species of bats, lizards, frogs, and sea turtles. The island would be better off without the mongoose which was introduced some years ago to kill rats and mice. However, it hasn't worked out that way, and instead the mongoose destroys the eggs and young of the more welcome animals.

At both Cinnamon and Caneel Bay, two evenings a week, the Park naturalists present interpretive talks on the human and natural history of St. John and its waters. These talks are excellent and help to make a visit to the Park more meaningful. At Cinnamon Bay these lectures

The cottage units at Caneel Bay.

The ruins of an old plantation are absorbed by the jungle.

Rock carvings or petroglyphs by the Arawak Indians may be seen above the pool.

are held outdoors near a campfire. Slides are projected on the wall of the commisary and the audience sits on trunks of coconut trees set on the ground.

The island has had a turbulent past. Its first inhabitants were the Arawak Indians, around the first century. Later this peaceful tribe came under constant attack by the fierce and cannibalistic Caribs. They left strange drawings on the rocks around the falls in the Reef-Bay valley. These petroglyphs can be seen by hiking several miles over a well-marked trail through lush forest growth. This is the wet side of the island where ferns and orchids abound. The beautiful quail-dove seems to favor this woodland, and it never ceases to startle the hiker as it flies out from the undergrowth with a great flutter. Along the trail are lime trees and many old ruins from the time of the Danish occupation.

There are many sugar mills and plantation ruins around the island which are rapidly reverting to soil. The National Park Service realizing this, but also knowing the impracticability of saving all, has concentrated its efforts on a few. Annaberg is one good example of an old sugar plantation and mill which has received attention. No reconstruction has been attempted, but rather preservation. Where a wall has started to cave in, it has been given support; where the forest tangle has encroached, it has been pruned back. A self-guiding trail leads the way through the site and a pamphlet describes the points of interest.

The group of Virgin Islands including St. John were purchased by the United States from Denmark as recently as 1917. After the abolition of slavery in 1848, it became economically impossible to continue the sugar industry, so there has been a long quiescent period in the history of St. John.

Gradually air and boat transportation have accelerated tourism in the Virgin Islands, and more visitors will discover the breath-taking natural beauty and quiet charm of St. John.

It will be interesting to watch the evolution of this Park. As the interisland transportation speeds up, the demand to open up more areas will increase. It will no doubt present problems. The National Park Service is aware of this and is handling it most remarkably. The program is being carried forth in a gradual growth pattern so that those persons who appreciate the natural beauties of such areas will find them preserved not only for themselves but for posterity.

Natural areas constitute an irreplaceable resource, as important to mankind as the earth's economic products. They are the living museums that exemplify the past for the benefit of the future. Once they have been destroyed, they are gone forever.

The more civilization crowds forward, the fewer natural areas there will be, and the more precious they will become. If there are to be any natural areas left for the future, they must be set aside today.

Natural areas are requisite to our way of life, for it is to nature that man frequently turns for inspiration. Also, they furnish the only true background against which to measure the changes that civilization has wrought in our environment. They often help us to understand and tolerate such changes. As living museums of an earlier day, they provide unsurpassed opportunities for studies in the natural sciences.

NATURE CONSERVANCY

THE LOWER PLANTS

By HERMAN F. BECKER

Dr. Becker, who is Curator of Paleobotany at The New York Botanical Garden, delivered this introductory lecture in the In-Service Course for Teachers, given at the Garden in cooperation with the Board of Education of the City of New York. His lecture was the first in the fall 1965 term on Non-Flowering Plants.

So CALLED "lower plants," compared with "higher plants," are those that bear spores instead of seeds as in the higher plants. This does not mean that they are primitive or poorly designed, or ill-equipped for life. On the contrary, most of them are extremely complex and therefore excellently equipped to thrive in their respective environments. In fact, they parallel in many ways the higher plants and often surpass them in choice of extreme ecological niches, the places where they live, and where sometimes even higher plants may not survive. Strangely enough, some of the lowest of the lower plants live in the Antarctic where temperatures are always below the freezing point and, at the other extreme, in the hot springs of Yellowstone Park and other volcanic areas where they thrive in temperatures of 180° or more. The evolution of their adaptation has come a long way during the past six hundred million years when the first algae were discovered in the fossil state. These "lower plants" then are the algae, the fungi, the molds, the lichens, the liverworts, the mosses, the clubmosses, the horsetails, the ferns, and, in comparison with the flowering plants, also the gymnosperms. The gymnosperms or cone-bearing evergreens, however, are really seed-bearing plants, only on a considerably lower level than the flowering plants. These are the cycads, the ginkgo, and all the conifers, and for this reason we shall not consider them here.

Let us look first at some basic characters which are common to most of these lower plants. They are spore-bearing, that is to say they form tiny, often microscopic, reproductive structures, the spores, which simply "grow" on the plant without benefit of fertilization by wind, insects, or any other agency. Many of these lower plants must go through a cycle of alternation of generations, which means that there is a generation of plants which grows the spores, called the sporophyte, and another generation of plants which produces the gametes, the egg and the sperm. They are therefore subject to sexual reproduction just as the higher plants. This generation is called the gametophyte. These are not only separate plants, in most cases detached from the sporophyte, but look entirely different from the sporophyte. Their size is extremely small, sometimes less than one quarter of an inch, and their only function is to facilitate sexual union of the gametes and to produce the young sporophyte which will then grow into an adult plant. This, then, represents a cycle of development which is essentially lacking in the gymnosperms and in the angiosperms, the flowering plants.

Even though the lower plants are primitive when compared to most higher plants, especially in their reproductive mechanisms, they are nevertheless extremely progressive and often so complex that their life cycles are not yet completely understood. This is especially true in some of the aquatic forms, the algae, where access to all phases of their cycle is often difficult. We have, among botanists, many researchers whose life's work is to study only one small group out of the many. These lower plants were not only able to maintain themselves over the past six hundred, or certainly four hundred million years, but to adapt and improve their structures without sacrificing their basic architecture and physiology to any great extent.

When did these lower plants first appear? What did they look like then? When did they emerge from the primeval ocean and go on to the land? The time of the first land plants is easily determined, because we find their fossils in the Devonian Period, in rocks which are about four hundred million years old. There is evidence that the first land plants arose from a branch of the green algae which were fresh-water algae rather than marine. Perhaps because of the long evolutionary development which they had already undergone, they were genetically equipped to live in the tidal zone or on mudflats of periodically drying lakes. Those which were best equipped to survive, at least part of the time, out of water transmitted this capacity to their offspring. This trend became accentuated in subsequent generations and finally fixed, so that they could eventually remain entirely out of water, near the shore or on moist banks of streams and lakes. Since all, or at least most of the lower plants depend on water for their reproductive process, in that the sperm must swim externally to the egg to fertilize it, these early land plants took a long time, geologically speaking, (perhaps millions of years) to disperse farther inland into new and unpopulated regions. Even there the early land plants, as do the lower plants today, depended on free water for the motion of the sperm so that they remained "amphibious" throughout their history. This dependency could be compared to the amphibian animals, the salamanders, the frogs and toads, which are bound to a moist environment for reproduction and remain chained to this method to the present time. The eggs, laid in the water, develop into tadpoles, emerging only when near maturity to go on land. Such a change or metamorphosis required of the land plants the biggest hurdle they ever had to overcome in their entire history.

Once on land they had to develop external protective structures to keep them from drying up, changed structures to anchor them to the ground and to make it possible for the spores to survive in a dry rather than a watery environment. Internally, they had to develop conductive tissue for water and minerals to be taken from the soil, a factor with which their ancestors, the algae, did not have to concern themselves since they

were supported, buoyed up, in the water and derived all their nourishment by absorption. Eventually, these early land plants had to develop a more extensive upright body structure, and leaves which took over the function of photosynthesis and respiration. On land they were also exposed to bright sunlight, to ultraviolet rays, to wind which threatened to dry them out, and to other hostile elements which were not present in the water. And so new protective layers and structures emerged on leaves and stems which took care of these contingencies in the new environment. For these drastic changes, evolutionary time of several million years was required. But once these basic structures were established, the land plants were able to diversify at a rapid rate. Since the land was empty, barren, there was no initial competition for ecological opportunities.

There is no doubt that many of the more drastic changes and adaptations came about through genetic mutation which are heritable and transmitted to their offspring. Fatalities were probably the norm; however, enough plants survived not only to carry on, but to improve upon their genetic heritage. One might say that these early land plants developed "the hard way" through lessons which cost them dearly in numbers of offspring. But nature is very prolific and takes a major loss into account. Once the plants were successful on the land, there was little external pressure toward an indefinite change, and so we recognize these early pioneers for what they are, horsetails, mosses, clubmosses, ferns, all comparing favorably in basic plan and structure with their modern equivalents.

Since detailed discussions on algae, mushrooms, lichens, ferns, and fern allies will follow during the coming lectures, I shall introduce them to you from a bird's-eye view.

Many of the algae, mushrooms, horsetails, mosses, and ferns are of economic value in varying degree, a critical point with many of us in this age of materialism. What are they worth? Can you make money with them? Can you eat them? Being a naturalist by preference, I look at the aesthetic side of our flora, at the excitement one can experience in exploring a pond or a bog, or the dim floor of a forest, or the woods and fields around us which are alive with lower plants.

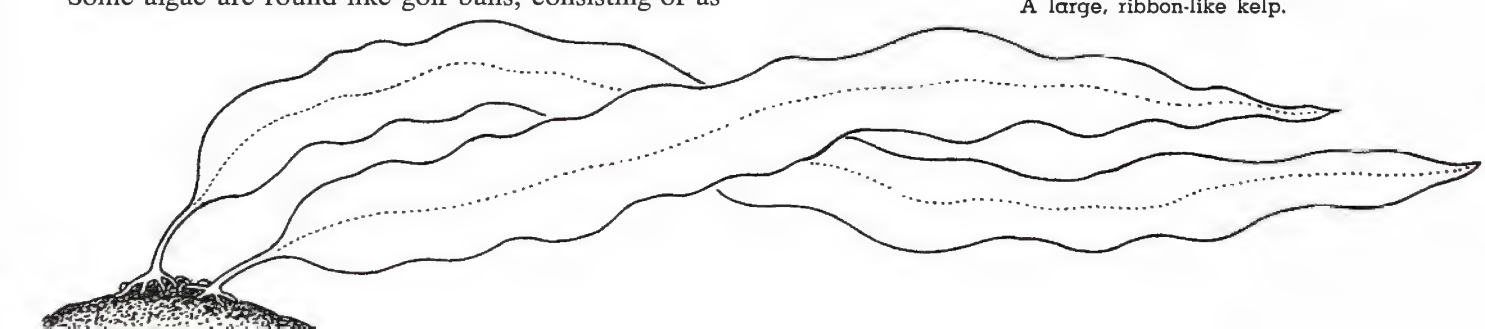
Let us begin with the algae. Many are unicellular and some of them behave like protozoans, namely, they swim by means of cilia or flagella. Here the structural difference is not so great between the animal and the plant world, except that the algae possess chlorophyll for photosynthesis which the protozoans and all other animals lack. The plants are autotrophic, actually producing their own food, while animals, from the tinest protozoan to man, are heterotrophic, that is, they feed on other organisms, animals or plants, on food which is already prepared.

Some algae are round like golf balls, consisting of as many as fifty thousand cells, but they are so small that a microscope is needed to study them. Most fresh-water algae which we see are of the filament type; the green, slimy, glistening strands and clumps floating in ponds and streams are of this type. Marine algae had an evolution all their own, and it is among these that many of the striking forms and colors are encountered. Along the rocky or pebbly shores of Long Island Sound, one can collect between twenty or thirty species in a short time.

Many algae can reproduce asexually by breaking up into fragments which grow again, or by zoospores, and sexually by different methods within their diverse life cycles. Economically the algae have reached prominence in the production of algin, a substance extracted from large, ribbon-like kelps which may grow to as much as one hundred and fifty feet long. Agar (agar-agar), a colorless, tasteless, and neutral substance is also produced in a thriving industry; when extracted and treated, this forms the basis for scientific culture media for molds in medicine and pharmaceutical endeavors. Many of these algal substances are the basis for gelatins, thickeners for soups and sauces, for puddings, ice cream, and other foods which we eat daily. The industry that developed around the commercial harvest of algae is an important economic factor in seashore or island countries, such as Ireland and particularly Japan. Iodine is extracted and potash produced from many algae, while others serve as fertilizers in agriculture when plowed under, or as fodder (supplementary) for cattle and pigs. Some species are consumed as whole plants by man, but they must be washed, dried, cut, and otherwise treated to become palatable.

Of the fungi I shall say very little, except that the mushrooms we eat are the fruiting bodies of the plant which, underground, looks like a web of fine, white threads. These so-called "hyphae" are the more permanent structures, while the fruiting bodies, mushrooms and toadstools, often last only a few days or less. These bear the reproductive spores which are mostly wind-disseminated (puffballs). To this group also belong the yeasts and the molds that produce penicillin, streptomycin, aureomycin, and other products now widely used in medicine. Their sizes range from unicellular, microscopic species to huge puffballs, twice the size of a football and weighing twenty pounds or more, or to bracken fungi two square feet in surface. Fungi do not photosynthesize, they have no chlorophyll, but they synthesize their food from decaying organic material in the ground and are therefore considered saprophytic. There are no green mushrooms. Since they need no light for their growth, we may find them in the darkest woods, even under logs, or covered with leaves, or even in caves. Many of the commercial mushrooms, the champignons, are grown on beds of mulch and manure in

A large, ribbon-like kelp.



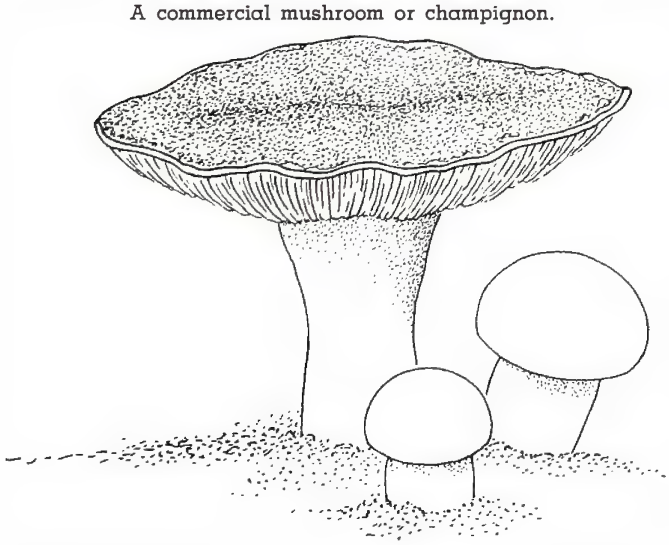
abandoned underground quarries such as exist along the Hudson in the Catskill area.

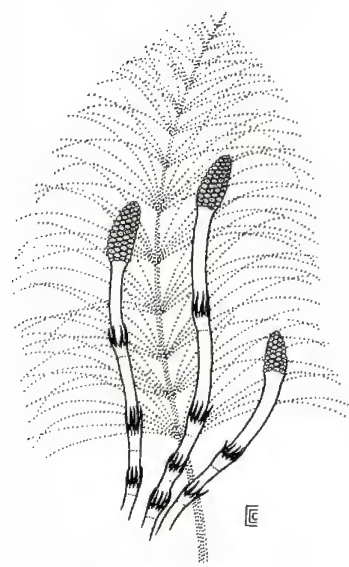
The lichens are of special scientific interest because they incorporate a symbiosis between fungi and algae. The outer body represents the fungal part, while tiny, unicellular algae live within the tissue of the plant. The fungus part supplies a habitat and protection for the algae which, in turn, photosynthesize carbohydrates benefiting the host. There is a mutual dependence—one could not survive without the other. This arrangement must be considered a high degree of specialization and adaptation by two groups of plants which are essentially primitive. Lichens are found on rocks as encrusting organisms, or on decaying tree trunks in the woods, or sometimes even suspended on coniferous trees as is Spanish moss (a species in the Pineapple Family). Their colors are mostly gray or nearly black, but there are also bright yellow and greenish colors. The lichens can survive extreme desiccation, becoming hard and brittle, and are then able to survive and grow after a soaking rain. Because they are extremely tough and hardy, they often grow on rocks at very high altitudes (thirteen thousand feet in the Rocky Mountains) where they initiate the disintegration of rock by producing an acid on their lower side. Thus they can establish themselves in a forbidding environment as pioneers, followed by a succession of other plants which require ground prepared for them.

One species, the reindeer moss, (not a moss, in spite of its name, but a lichen) is of significant economic and ecological importance in that it is practically the only food for reindeer in North America and Lappland. The animals forage in the snow to scrape out the lichens without which they would starve during the winter. Many Eskimos and Lapplanders depend entirely on the reindeer for food, clothing, and tools made of their bones. Essentially then, it is this lichen which provides the basis for their livelihood.

The mosses and liverworts are an equally interesting group with hundreds of species inhabiting the moist and shady woods of the temperate zone. Their life cycle, which involves a partially amphibious environment, is complex and varies with the many species. The liverworts are mostly low, prostrate plants of small size which cling to the soil or live on damp rocks where water is available. They are of no commercial value, but in nature they fill an otherwise vacant environment, or live as companions and often mixed with mosses. Superficially many of them resemble mosses, but their basic structure differs.

A commercial mushroom or champignon.





Above, horsetail or equisetum.
At left, sphagnum moss.

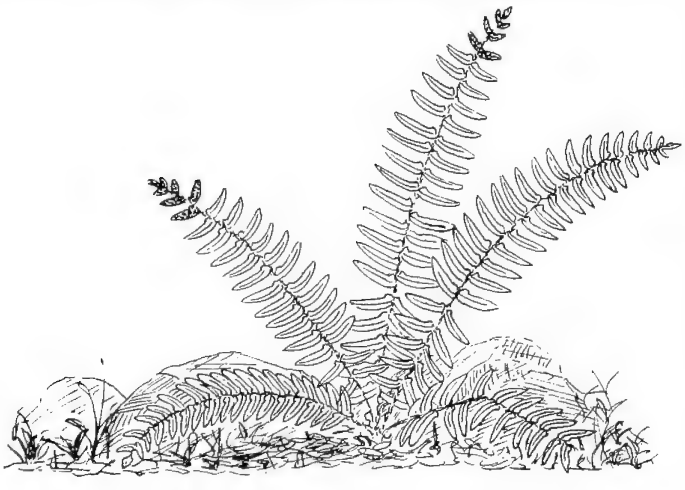
The mosses are more numerous in species and also complex in their reproductive structures during the development of the spores. In some instances, the gametophyte remains attached to the sporophyte. One of the important "economic" mosses is the sphagnum which produces the peatmoss used to mulch the ground and to supply acidity and aeration. The peat industry is quite important for Canada, parts of the northern United States, especially northern Michigan, Ireland, North Germany, and Sweden. Canada possesses about thirty million acres of peat, the United States about twenty million, and Ireland just short of three million. Most of the American peat is used in gardening, but much of that of Europe, especially of Ireland, is cut and dried in large blocks or pressed into briquettes for fuel, in place of coal or wood. Peat is merely the old, dead part of the sphagnum plant which may accumulate to thicknesses of thirty feet or more. Sphagnum requires much water for its growth and thrives in bogs or open and woody areas with poor drainage. All, or at least some of these requirements are met in the areas mentioned. The important qualities of peatmoss are its great organic content, its porosity and absorbing power, its acidity, and therefore an absence of decay bacteria which makes it sometimes useful in pharmaceutical application. Mosses often grow in cushions on the floor of the woods, on tree trunks or on rocks. They are never very large and can usually be recognized by their capsules on thin, wiry stalks.

The horsetails, or equisetums, which is the Latin name and literally means horse-tail, are externally perhaps most like their ancestors of three hundred and fifty million years ago. They are one of the oldest families in the plant kingdom. They have no leaves to speak

of, naked stems which are ribbed and segmented, and they may be with or without branches. Their conelike reproductive structures contain the spores which are shed like clouds of dust. They range in size from a few inches to several feet, especially in the Tropics. Their favorite habitat is in moist areas near bogs or streams or in drier waste areas near railroad tracks; some species live even in sand dunes, where they may be the first plants to anchor the sand (Sleeping Bear Dunes, Michigan). Few animals eat them, because they secrete silica crystals within their cells which makes them hard and brittle and unpalatable. These minute, sharp crystals of silica made the plant ideal in bygone days for cleaning pewter ware; in Germany the plant is called zinnkraut, or pewter-weed, for this reason, while we know it as scouring-rush. To my knowledge, it is the only commercial application for the horsetails.

The clubmosses or lycopodiums (lycopods) are still another plant group which receives much attention from the evolutionist, the amateur botanist, and the conservationist. With only a handful of species, they are the evolutionary remnant of their ancestors during the Carboniferous, or coal age, about three hundred million years ago. At that time the clubmosses attained the size of trees, often a few feet in diameter. The present living forms are all very small, often prostrate or creeping, forming thick mats or clones on the drier forest floors. The name clubmoss is derived from the club-shaped spore-cones on a mosslike plant. The name, as in so many plants and animals, indicates the wrong relationship; the plant is not a moss. During the reproductive period, their attractive terminal cones are filled with yellow spores. Before the electronic flash, or the flash bulbs we used in photography, lycopodium powder served this purpose. Masses of spores may easily be collected. Because of their high content of waxes and volatile oils, they are extremely flammable, and the powder ignites and actually explodes with a bright flash and considerable smoke. Occasionally, lycopodium powder may be bought in some old-fashioned pharmacies. A sad aspect from the conservationist's point of view is the use of lycopodium plants for dried and dyed Christmas wreaths, mostly an atrocious red. This commercial exploitation of an already rare plant has led to its extermination in many areas. Clubmosses are generally protected under local or regional systems of conservation of wildflowers.

The Christmas fern, *Polystichum acrostichoides.*



Of ferns I could speak endlessly. They are by far the most numerous in species (nine thousand), the most widely distributed, and have the most varied forms in all latitudes of the earth. Since Louis P. Politi and Eleanor Yarrow will present lectures on this subject, I shall be brief. Ferns and fernlike plants were some of the first to emerge early in the development of land plants. In the Paleozoic they became the dominant feature in almost all parts of the earth, during the time of the amphibians and reptiles. After the Carboniferous they declined somewhat, became reduced in size, but expanded again to their present number of species. There is some evidence that the ferns, or seed ferns, may have given rise to the flowering plants of today.

Ferns are spore-bearing plants, and since their reproductive cycles are quite complex, they may be considered the most advanced of the lower plants. Their life cycle in the form of an alteration of generations has been worked out for most species and offers classical classroom demonstrations. We begin with the sporophyte, the conspicuous fern plant with rhizomes (underground stems), roots, fronds or leaves, and their variable spore-bearing sori, mostly arranged in patterns on the under side of the leaves. Some ferns, the royal-fern group *(Osmunda),* the grape-ferns *(Botrychium),* and the sensitive-fern *(Onoclea),* and a few others, bear their sporangia on separate stalks. They are said to be "dimorphic" or of two different structures.

The sporangia are located in the sori; they shed their spores when ripe by various mechanisms of dissemination. The spores germinate, and now the gametophyte cycle begins. A prothallium grows from the spore, a thin, prostrate, small, leaflike structure the size of a dime or even more minute. The prothallium is filmy, very delicate, and has a relatively short life. On its underside develop the eggs and the sperm in separate structures called the oogonium and the antheridium. With the help of a drop of water or moisture from dew or condensation, the sperm swims to the egg and fertilizes it. The sperm and egg are reproductive cells called "gametes," and this is why we call this part of the life cycle the gametophyte generation. After fertilization a zygote is formed, an initial embryo which now begins to form the young fern plant. As soon as the embryo grows we have a sporophyte generation (the young plant) which remains temporarily attached to the prothallium (gametophyte) which soon withers after having performed its function in the cycle.

Ferns have taken over almost any part of the world where some of their specific requirements are met. In temperate areas they grow best in cool, damp, shady woods, but in the Tropics they really proliferate like other tropical plants. They may have fronds ten feet in length, some are tree ferns with trunks up to sixty feet high, especially in Mexico, South America, New Zealand, and Australia. Others are climbers with twining stems, and still others are epiphytes growing on trees to reach the light. The smallest of the grape-ferns is less

than one inch high. Ferns also live in crags and cracks of the rocks high in the mountains where temperatures range to below zero, and by contrast have invaded some deserts where they developed structures which prevents their desiccation. These are usually small and compact, often have leathery leaves and a coating of hairs. But like all the lower plants, the ferns can never get away from their amphibious heritage, that is, they must have water at the time of fertilization of the egg by the sperm, even if it is only the dew of the night in the desert.

A few species of ferns are completely aquatic. These are mostly small with leaves which are not easily recognized as fernlike. Their leaves are filled with air spaces and the surface is covered with dense hairs which catch air, all of which serve them to float. One example is the species *Salvinia* in some of our more southern states, where they reproduce asexually at such a rapid rate that they can clog ponds and shallow lakes within one growing season. Other, semiaquatic ferns live with their roots submerged near the edge of lakes; some of these have leaves which look like four-leaf clovers and they grow sporocarps, capsule-like structures which have a hard coat and are able to float.

Ferns are perhaps the most popular plants to interest the amateur and nature lover, because they are everywhere, even near big cities. Many good fern guides are published for almost any state or local region. Their commercial value is limited, if we disregard those which are grown to be sold as potted plants. The dense, fibrous root masses of the royal-fern, however, form an important, indispensable rooting medium for cultivated plants such as orchids and members of the Pineapple Family. These roots are tough, resilient, do not decay easily, and hold the potted plants firmly in place. Sometimes the root fibres of polypodium, a native fern, are also used for this purpose.

SPRING IN THE FLORIDA PANHANDLE

By GEORGE A. ELBERT

Mr. and Mrs. Elbert, who are enthusiastic amateur botanists, visit many interesting and less-known areas to photograph native plants about which they write and lecture.

FEW NORTHERNERS are familiar with that section of Florida which extends almost as far westward as the penninsula stretches to the south. The heavy traffic passes into the state west of Jacksonville and then splits into the east and west highways which lead to the subtropical resorts on the Atlantic and Gulf Coasts. The panhandle is too cold for winter sunning and swimming and far from concentrations of population and industry.

We chose this area for a vacation at the beginning of April, 1964, because a study of its topography suggested that there would be a good concentration of flowering plants to photograph and some good beaches to enjoy. The floral display was everything we could have wished for.

The first few days were spent in and around Appalachicola, a pretty, quiet, old town, formerly the cotton port of the state. Later we moved to Mexico Beach, thirty miles to the west, beyond Port St. Joe. In the morning we explored, botanized, and photographed. In the afternoon we swam off the deserted beach and in the evening devoured the local specialties, snapper throats and oysters. Very few people passed through the towns, and the forests were so vast that we rarely met up with lumbering activities.

Here we found three botanical zones: a very narrow strip, including offshore sandbar-islands, rather poor in typical beach and salt-marsh species; an alluvial deltaic plain which stretched inland some thirty to forty miles; and the rise to the true coastal plain ecology. In this last region farms appeared, mainly of tobacco, protected by acres and acres of plastic netting held high above the plants. Lower soil and atmospheric moisture and a slight drop in the mean temperature supported plant life little different from the rather poor productivity farther inland and extending east to the Atlantic. It was only along water courses that there was much to see.

As was to be expected, our best area was the extensive lowland. This consisted largely of true swamp, gloomy gray with cypress and Spanish moss, provided by the locals with such fine names at Tates Hell Swamp, Indian Swamp, Alligator Swamp, and Old Camp Four Swamp. Then there was dry pine land with palmetto scrub and wet grass land, part shrub and part pine. This semimarsh was alive with herbaceous plants and yielded our most beautiful specimens.

The spectacular nature of the flower display in the lowlands, though not its variety, of course, is due in large part to the road-building activities of the state and the paper companies. To preserve the highways and access roads from the effects of concentrated rainfall, capacious drainage swales have been excavated all along the right of way. And in order to protect the forest against the spread of fire, both state and companies have learned to cut the woods far back from the dirt or macadam. Thus a grassy areas has been created which retains a controlled amount of moisture at all times and is, at the same time, completely open to the sun. Here a great number of wildlings, those which would not be permanently damaged by the mowing machines, have colonized.

This planning for an entirely different purpose has resulted in an enormous flower bed which lines the roads in all the moist areas with the colors of the seasons. Never have we seen such masses of flowers in the East

—salvias, sisyrinchiums, polygalas, aletrises, droseras, pickerel-reeds, cosmos, some magnificent yellow composites, sagittarias, pinguiculas, verbenas, and even some orchids in solid or nearly solid growths.

The effect is totally different from spring in the temperate North and yet it is not quite tropical. The buttercup, lily, rose, saxifrage, and crucifer families represented in the North by so many different species are either totally lacking here or greatly reduced. Yet the species which do occur may be present in great numbers.

Another oddity of the flora of this zone is the prevalence of insectivorous plants. The only important missing member of the insectivorous group is the Venus flytrap, which is found along the coast of North and South Carolina. But there were butterworts, sundews, and pitcher-plants in abundance. We found varieties new to us and perhaps interesting to describe in some detail.

The sundews are small plants whose leaves are modified into fleshy, threadlike, round or spoon-shaped processes covered with hair and exuding quantities of clear, sticky liquid. A tiny insect becomes entangled in the invisible jelly, nearby hairs flex toward it further impeding its movement, and, once it has given up its struggles, it is gradually digested. The flat-leaved types are usually quite small, one to a few inches high, with the leaves arranged in a rosette; the five-petaled flowers, on a relatively long peduncle, rise from the center. They are surprisingly large, and opening one by one early in the morning, close promptly around noon. I have chased flower after flower, as I tried to set up my camera and photograph at least one, before it closed with frustrating rapidity.

In the filiform sundews, the leaves are reduced to erect threads. *Drosera capillaris* grows to a height of more than a foot, and its pink flowers, an inch across, opening one by one in scorpioid arrangement, are very lovely. Great sheets of these plants present an amazing sight along the roadside—the beads of secretion on each hair flashing in the sunlight create a golden haze strewn with glowing pink accents. Another, and smaller, species, is *D. tracyi.*

The butterworts *(Pinguicula)* form a particularly delightful group, akin to primulas in their charm. The light green leaves are broadly triangular, folded in along the margins, and are arranged in two or three overlapping series. They are slimy to the touch and almost gelatinous in texture—in fact, they look like complex stars molded out of whipped green gelatine. It is on this sticky surface that alighting or crawling insects are held fast.

The flower is lovely and curious. Shaped like a cornucopia, it hangs horizontally from a spatulate calyx which seems to be glued to the upper surface. The two larger varieties, *Pinguicula caerulea* and *P. lutea,* with stems a foot or more long and flowers an inch and a half to two inches long, are both showy and common. The blue species is very deep in color and strongly veined. The yellow is the taller, is pure butter-yellow, and grows in considerable clumps. There are two smaller varieties in the region, both blue, *P. pumila* and *P. planifolia.*

The bladderworts *(Utricularia)* are the most curious and ingenious of all these strange plants. The flowers are the color of and resemble in appearance a snapdragon, but are carried singly or in distant whorls on thin stems. Some varieties are common in the North, where they may be seen floating on the surface of ponds in great numbers. If you grasp the stem and pull the plant out of the water, you will see that the root consists of an extensive mass of ciliate petioles ending in tiny, black spots which, under the magnifying glass, reveal themselves as miniature leaves in the form of bladders. These support root and flower in the water. Other bladders are even more specialized, being partly open and serving as traps for minute pond creatures. In addition to this formidable and unique equipment, the southern species, *Utricularia inflata* and *U. radiata,* support the peduncles gracefully erect on a five-limbed float, visible on the surface of the water.

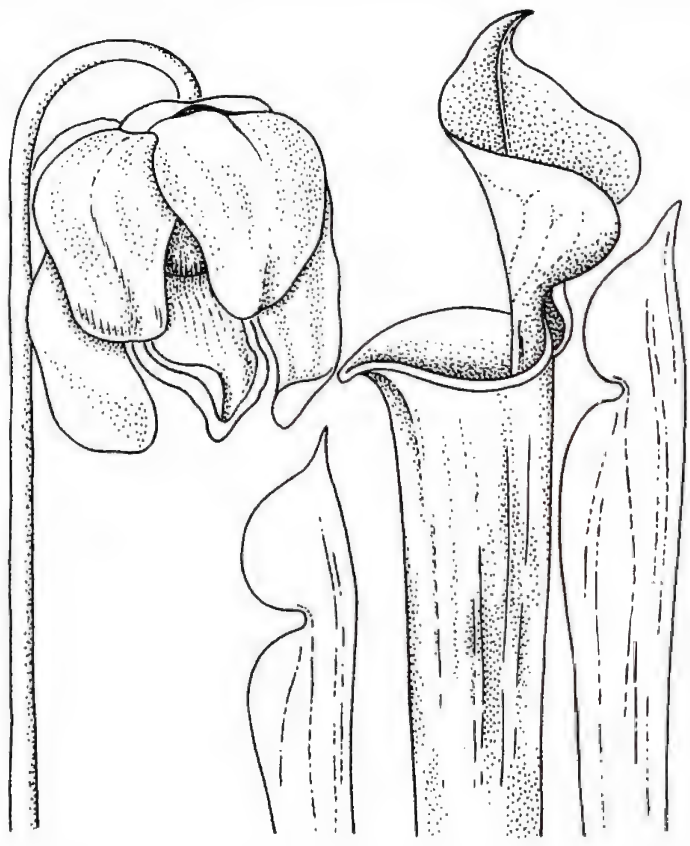
Our first sight of the purple bladderwort *(Utricularia purpurea)* was a surprise. We were not prepared to find it such a tiny creature, dotting the surface of mud runs in a grassy field.

Grandest of these plants are the pitcher-plants. *Sarracenia purpurea,* a species found from Labrador to Florida, has long-stemmed, red flowers and veiny, green or reddish pitchers, half prostrate, containing a fluid in which insects are drowned and absorbed. They are common enough in our sphagnum bogs in the open.

It is difficult to decide whether the flower or leaf of the yellow pitcher-plant *(Sarracenia flava)* is the more extraordinary. The brilliant yellow flowers, four inches across, are borne on scapes up to two feet tall and ap-

(Continued on page 26)

Sarracenia flava.



CONIFERS IN THE NIKITA BOTANICAL GARDENS YALTA, CRIMEA, U.S.S.R.

By M. M. BESKARAVAYNY and VALENTINA BOGOLJUBOVA

Mr. Beskaravayny is a Senior Research Worker and Miss Bogoljubova a Technical Assistant in the Department of Dendrology and Decorative Horticulture in the State Nikita Botanical Garden.

THE STATE NIKITA BOTANICAL GARDEN, dating from 1812, was one of the first to start experimental planting of exotic woody species. Among those brought into the Crimea from other lands the conifers were given preference, for they have long been renowned for their economic importance, ornamental value, and adaptability to many climates and soils, as well as for their quality of enduring cold without loosing their summer aspect.

The climate of the Crimea imposes certain limitations in choosing plant material for introduction. As the result of trials with three hundred and fifty conifers species during a period of one hundred and fifty years, only approximately a third of these was successfully brought into cultivation.

Some of the species did not survive because of their low hardiness. Of those which failed we mention *Dacrydium* Sol., some *Podocarpus* species, *Araucaria excelsa, A. braziliana* Rich. *Pinus ayacahuite* Ehrenb., *P. canariensis* Smith., *P. oocarpa* Schiede., *Callitris* Vent., *Tetraclinis* Mast., *Tsuga dumosa* Eichl., while others, such as *Saxegothaea* Lindl., *Podocarpus latifolia* Wall., *Tsuga caroliniana* Engelm., *Tsuga mertensiana* Sarg., *Tsuga sieboldii* Carr., as well as *Abies* species from Siberia and North Europe failed because of their low drought-resistance.

As our experience shows, we can grow almost none of the genus *Taxodium* nor *Tsuga canadensis* Carr., nor *Pinus echinata* Mill. on account of the high lime content of our soils.

At present, there are one hundred and one conifer species in the Garden, apart from thirty-nine varieties and hybrid forms. Moreover, as a result of repeated seed introduction from many geographical areas, there is a rather large number of specimens yet fully undetermined, undescribed, and unnamed. Of these there are some interesting forms of *Cedrus, Cupressus, Taxus,* and other genera, characterized by a high degree of genetic diversity.

All the conifers in the Garden can be divided into the following groups, representing the four floristical areas:

Eurosiberia	10 species
Asia (mostly China and Central Asia)	25 species
The Mediterranean area	26 species
North America	40 species

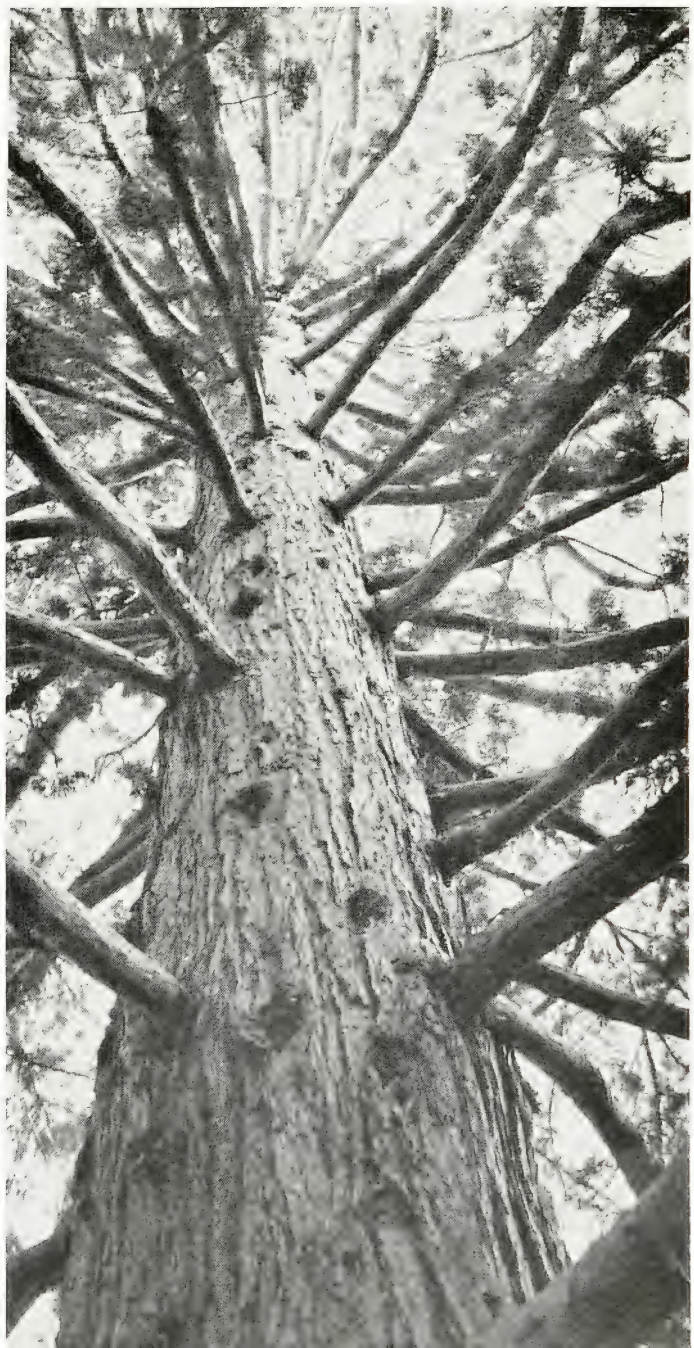
In terms of percentage, the figures are approximately the same.

Species from China, Central Asia, and the Mediterranean area, as well as from the arid regions of North America, are among the leading species in our collection and thrive best. As it is impossible in a short article to give even a brief account of all the species successfully grown in the Garden, we shall try to convey only such information as is absolutely necessary on the behaviour of some of the most important and interesting species.

Pines, the most numerous representatives of *Pinaceae* in the Arboretum, form a group of twenty-six species.

Of local pines two have a rather wide distribution in the Crimea; *Pinus pallasiana* Lamb. and *P. stankewitczii* Fom., both are of the two-leaved type. Pure stands of *P. pallasiana,* with undergrowth of *Juniperus oxycedrus,* or mixed stands cover the southern slopes of the Crimean Mountains, often among bare rocks and high over precipices, and always very picturesque. When

Sequoiadendron giganteum.



growing on deep and damp soil, the trees measure as much as one hundred feet in height and two and a half feet in diameter. The bark is silvery gray, breaking off in fine plates. In the lower belt of seaward slopes of the mountains, extremely drought-resistant and fast-growing *P stankewictzii* thrives in association with *Juniperus excelsa* M.B., and *Quercus pubescens* Willd. This area is bathed in heavy fogs of early spring, and these salt-laden fogs, as well as fine sea spray, do not affect (and seem to favour) the development of this species. In dry, rocky soil twelve-year-old trees measure up to ten feet high and 3.2 inches in diameter. Cones are very nice, light brown and shining. It stands transplanting well.

Of the exotic pines, *Pinus pinea* L. is one of the best, though it is not hardy enough and in the more severe winters its foliage is somewhat damaged by frost. Among the hardiest are *P. halepensis* Mill., *P. eldarica* Medw., and *P. brutia* Ten. forming, together with *P. stankewictzii*, a close ecological group. Their morphological characteristics have much in common, and many of the botanists consider (and very rightly, too) these species as ecological types of *P. pithyusa* Stev.—relics of the Tertiary floras. Detailed discussion of this matter is presented in an excellent book, *The Pitsunda Pine* by Prof. Kolesnikov, published in the U.S.S.R. in 1963.

Many of the American pines have found a second home on the Crimean Black Sea coast, and only a somewhat retarded development is observed in *Pinus edulis* Engelm., and in *P montezumae* Lamb., the latter being subjected to excess lime in the soil and the former to lack of adequate moisture.

Below are given some measurements to prove our conclusions:

Firs are represented by twelve species, two of which are rather uncommon. *Abies equi trojani* Asch. et Sint. is a settler from western Asia Minor and, after growing for about one hundred years in the Arboretum, has reached the height of sixty-three feet with a trunk diameter of twenty-eight inches. *Abies borisii-regis* Mattf., native to southern Bulgaria and northern Greece, at about the same age is fifty-five feet tall and twenty-eight inches thick.

Other species of *Abies,* which we grow with remarkable success, are *Abies numidica* De Lannoy, *A. cilicica* Carr., *A. cephalonica* Loud., *A. pinsapo* Boiss., *A. nordmanniana* (Stev.) Spach. One of the largest trees of *A. numidica* is sixty-three feet high and 27.2 inches in diameter at the age of eighty years. The tree looks very impressive, and its leaves are glossy, dark green.

All *Cedrus* species grow to perfection in the Arboretum. The first specimen of Deodar cedar, brought to the Garden as a seed one hundred and twenty-two years ago, has now reached seventy-three feet in height and forty-one inches in diameter of trunk. Hundreds of Deodar trees are now found along the Black Sea coast of the Soviet Union.

The oldest specimen of the Lebanon cedar, at the age of one hundred and thirty-six years, is sixty-three feet high and forty-five inches thick. Several specimens of this cedar, one hundred and twenty-three years old, make a beautiful grove in the Lower Section, perhaps one of the loveliest spots in the Arboretum.

There are many silvery and blue forms of *Cedrus atlantica* Manetti, the most bizzarre and unusual of which is *glauca pendula* Beiss, represented by several specimens of different age. In the older trees the horizontal growth is now about thirty feet long with lateral branches reaching the ground.

We can not but mention some representatives of the genus *Picea* in the Arboretum, numbering ten. The most important of all is *Picea pungens* Eng. and its more ornamental forms *argentea, glauca,* and *kosteriana.* Though slow-growing at first, they eventually make very good ornamental trees, quite drought-resistant and hardy. Somewhat less hardy, but in no way less decorative, is *P. morinda* Link. with its drooping branches and light green foliage.

Now, a few words about three redwoods. Although

Specific name	Age of a tree	Height (Ft.)	Trunk Diameter (In.)	Crown diameter (Ft.)
Pinus coulteri	45	38.0	10.4	
Pinus coulteri	97	50.0	21.0	
Pinus edulis	42	32.7	13.2	33.3×37.0
Pinus ponderosa	123	67.0	34.8	
Pinus jeffreyi	104	50.0	20.0	
Pinus montezumae	123	53.3	34.0	
Pinus montezumae	122	67.0	38.0	
Pinus excelsa	57	53.3	11.2	
Pinus excelsa	28	40.0	10.0	
Pinus gerardiana	144	50.0	20.0	
Pinus pinea	133	41.6	37.2	70.0×53.3

A superb Cedrus *atlantica pendula*,
with lateral branches reaching the ground.

A specimen of Cedrus *libani*,
one hundred and thirty-six years old.

Pinus pinea in the Upper Section
of the Nikita Botanical Garden.

One of the fine Cedrus *deodara* trees along a road
in the Nikita Botanical Garden.

our trees are just babies in comparison with their many-century-old relatives in their home lands, they are big enough to be mentioned and to be proud of. *Sequoiadendron giganteum* Buchh. thrives best and at the age of eighty-five is ninety-one feet high and fifty-four inches in diameter.

Sequoia sempervirens Endl. requires constant irrigation and, if provided with it, grows very well. In fact, the thirty-five-year-old trees in the Arboretum measure as much as sixty feet in height and twenty inches in diameter. The eighty-five-year-old tree is seventy-one feet tall and forty-eight inches thick. Both these species are very promising as forest trees. Although they produce only few viable seed, we propagate them by thousands by root cuttings and dispatch annually a great number of young trees for planting in the Crimean Mountains and in suitable regions of the southern part of the U.S.S.R.

The Chinese redwood, *Metasequoia glyptostroboides* Hu et Cheng, was brought to the Garden from China in 1953 as several-week-old seedlings. At present the trees are twenty-five feet tall and five inches in diameter. To grow normally this redwood requires irrigation; it is quite tolerant of lime. Its root cuttings we use as understock for *Taxodium*.

The genus *Cupressus* is represented by twelve species: nine from North America, two from China, one from the Himalayas, and one from the Mediterranean. *Cupressus sempervirens* L., together with its most common horizontal and pyramidal forms, has long become an integral part of the South Crimean landscape. Its numerous garden forms, including weeping, dwarf, and variegated, give a rich choice to a landscape architect.

Unfortunately, we cannot say the same about Asiatic species — *Cupressus torulosa* D.Don, *C. duclouxiana* Hickel., and *C. funebris* Endl. These are far less hardy, and irrigation all the year round is a "must" for them.

Of American species, the most adaptable to our conditions as well as the most decorative are *Cupressus macrocarpa* Hartw. and its yellow-tipped garden form *aurea, C. arizonica* Green, and *C. guadalupensis* Wats. Among the seedlings of *C. arizonica* we have selected many interesting forms which differ in habit and colour of the leaves. *Cupressus lusitanica* Mill., and its numerous forms are not as drought-tolerant as we should like them to be. As it is, they are used only in a few rather damp locations. The rest of the species (such as *C. macnabiana* Muir., *C. californica* Carr., C. *goweniana,* and some others), producing a negligible amount of viable seed, have not yet been properly studied and accordingly have not gained wide recognition.

Of special interest in the Arboretum are many garden forms of yew. The only representative of its family growing wild in Europe, it may be found in the Crimean Mountains as multi-trunked trees up to thirty feet tall, as a small, thick bush, or even as a prostrate shrub clinging to windswept rocks. Some large specimens remain in the Arboretum from the former woods after the land-clearing operations. One of the oldest trees of *Taxus baccata* is thirty feet high with many trunks measuring from four to sixteen inches in diameter. Its estimated age is far over five hundred years. Its garden forms *fastigiata, erecta aurea-variegata,* and *imperialis* are among the loveliest. A broad, dark green column of *T. baccata fastigiata* with almost evenly cut summit is very ornamental, the more so because of the stability of habit in the older trees. Where space is not an important factor, a broad rosette of long lower branches of the imperial variety develops to perfection; this is the case with our tree in the Upper Section, the rosette of which measures fifty-seven by fifty-three feet across.

Yew's American relative, *Torreya californica,* is represented by the only mature tree, ninety years old, reaching the height of thirty feet. In odd years it yields a few fertile seeds.

At the Nikita Botanical Garden studies are in full swing on methods of propagation of ornamental conifers by grafting them on to stocks with more desirable characters. It has been found that *Cupressus sempervirens* is an excellent stock for all other cypress species as well as for juniper, thuja, and chamaecyparis. Grafted specimens grow much faster in comparison with ungrafted seedlings or rooted cuttings.

As for pines, they give really very good results when just germinated seeds are marcotted on one- or two-year-old seedlings of local pines. It is interesting to note that the grafts are successful, regardless of the systematic group the pines belong to. That is, two-, three-, or five-leaved pines give equally good results when used both as understocks and as cion wood.

Breeding work for improving hardiness in the conifer species, especially in cypress, is of great importance for the steppe regions of the Crimea are in urgent need of evergreen ornamentals. Our studies show that cypress is pollinated by many species of juniper, thuja, chamaecyparis, libocedrus, or biota. The resulting hybrid seeds are treated in a low-temperature chamber and sown in the central part of the Crimea for future selection of the hardiest specimens.

O wild West Wind, thou breath of Autumn's being,
Thou, from whose unseen presence the leaves dead
Are drawn, like ghosts from an enchanter fleeing.

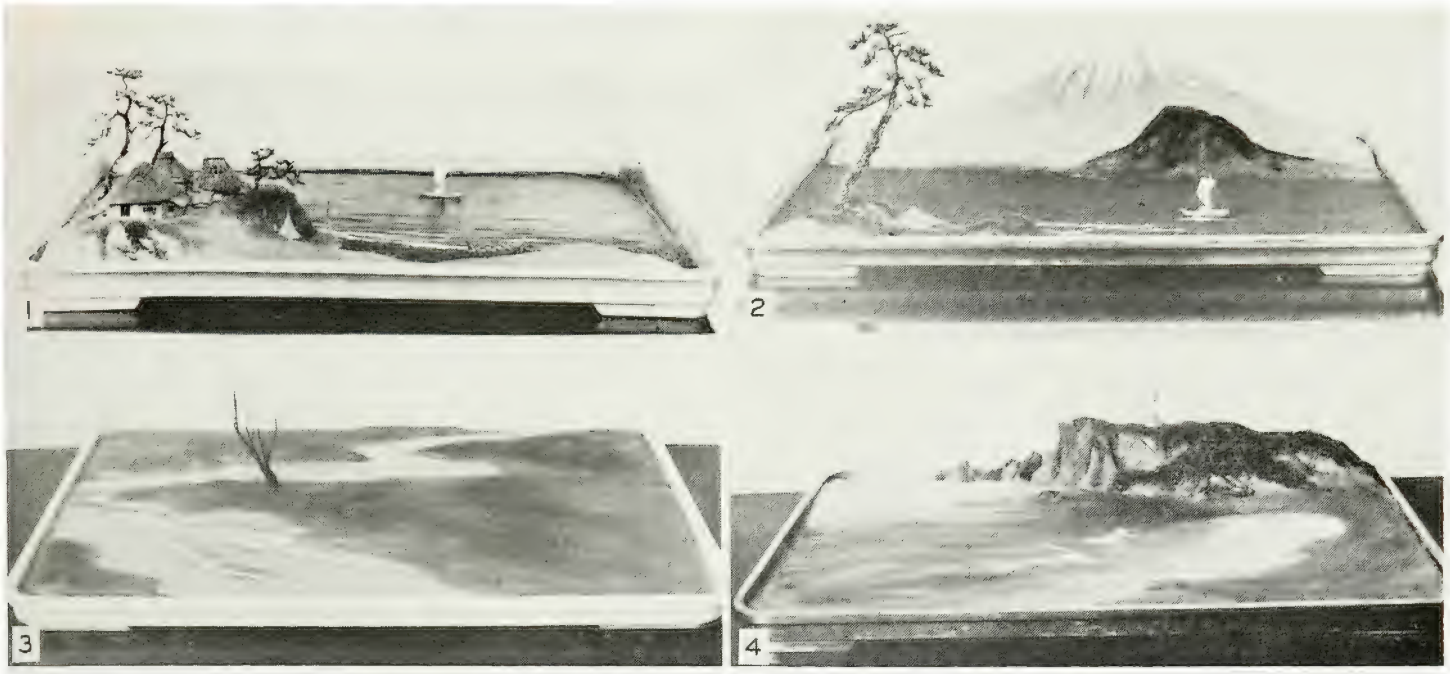
Yellow and black, and pale, and hectic red,
Pestilence-stricken multitudes: O thou,
Who chariotest to their dark wintry bed

The winged seeds, where they be cold and low,
Each like a corpse within its grave, until
Thine azure sister of the Spring shall blow,

Wild Spirit, which art moving everywhere:
Destroyer and preserver, hear, oh hear !

The trumpet of a prophecy! O wind,
If Winter comes, can Spring be far behind?

PERCY BYSSHE SHELLEY



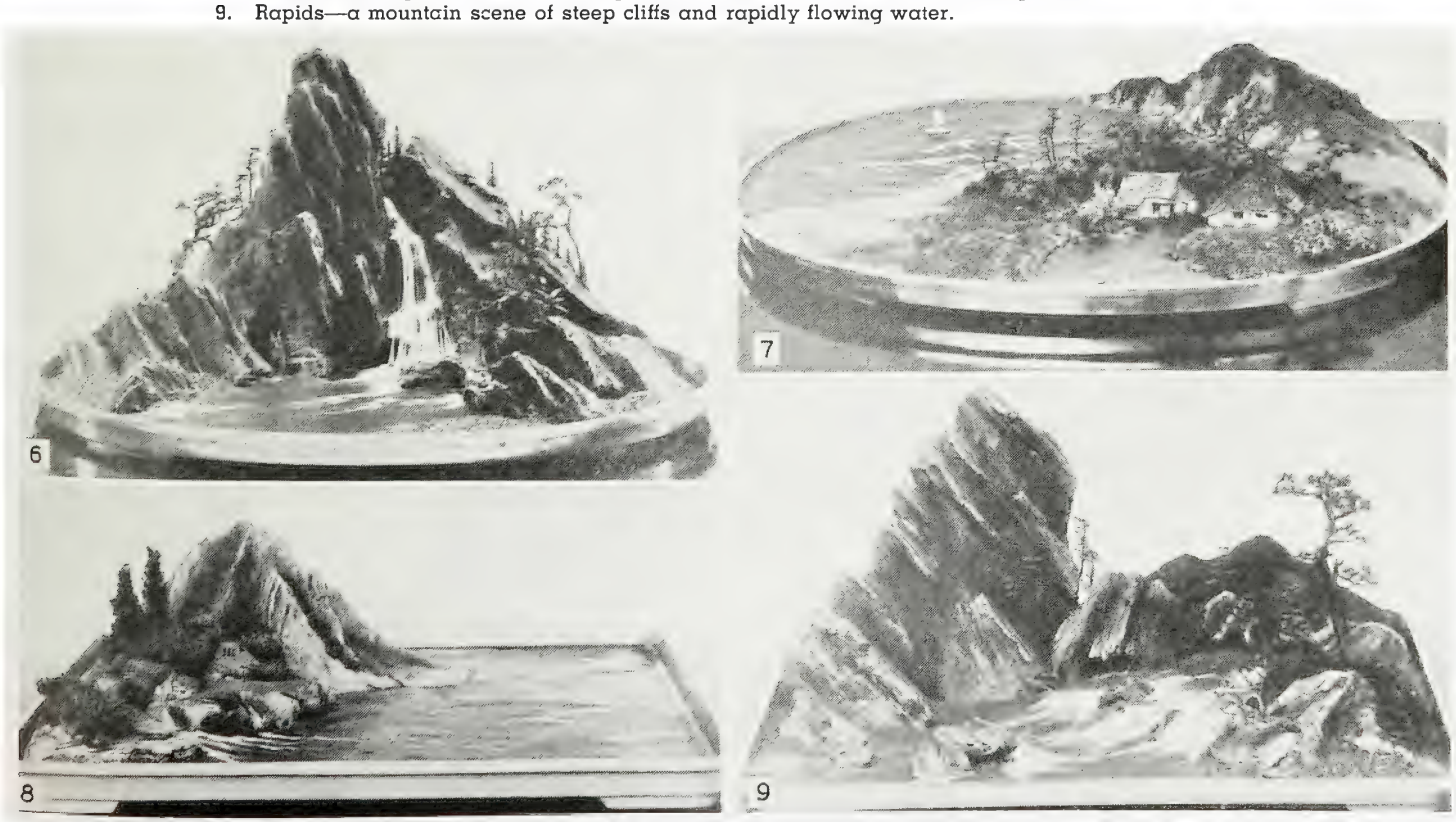
1. Fishing village—depicting a sea scene with boat, nets, towering rocks, trees, and cottages.
2. Mt. Fuji from Lake Kawaguichi—towering cliffs and a boat sailing on the lake.
3. Coming of spring—represented by a plum tree ready to bloom, green meadows, and stream.
4. Japan's famous lighthouse at Innubozaki on the high cliffs above the sea.

BANKEI — TRAY LANDSCAPE

By MARY KAJIHARA

Mrs. Kajihara represents the Formative Art Shizan School of Japan in America, and heads the Daigo School Ikebana and Sanko Arts Studio at Fort Jay, New York.

6. Waterfall—a pretty waterfall tumbles down a towering mountain into a stream.
7. Seashore—a village nestled against hills, trees and other vegetation, and the sea.
8. Waterwheel by the lake—a country house, waterwheel, lake and towering rocks.
9. Rapids—a mountain scene of steep cliffs and rapidly flowing water.



5. Autumn moonlight in the mountain—towering mountains, moon, evergreen forest, and house.

BANKEI, OR TRAY LANDSCAPE, may be described as the art of creating, portraying, and reproducing a scene in three dimensions on a rectangular or oval tray or dish, made of metal, porcelain, wood, or plastic. It may be small to very large in size, as the occasion requires. Such materials as clay (keiso), sand, pebbles, colors, artificial or live plants, moss, and ornamentals are used, and the tools are spatulas, brushes, spoons, and sieves.

This charming art, and pastime, is believed to have originated in the thirteenth or fourteenth century and centers around the love of nature, which finds expression in various other phases of Japanese culture such as landscape gardening, bonsai, flower arrangement, and the tea ceremony.

If you could reproduce in miniature a memorable scene—a beautiful landscape or seascape which impressed you during a trip abroad or in your own country—just by the use of earth, stones, and sand—how interesting it would be.

Illustrated are a few examples made for students in a beginner's class and in an intermediate class of Shizan School of bankei.

SPRING IN THE FLORIDA PANHANDLE (Continued from page 20)

pear when the trumpets are half-grown. They are pendent and consist of a calyx from whose center projects a flat shield covering the style, like a giant collar button. The shield is wavy in outline, and between the recesses hang the long, fiddle-shaped petals. Long after the petals have dropped, the calyx and shield are decoratively persistent. For the entering insect, the area behind the shield is a temporary trap.

In this species trumpet is really a better descriptive word for the leaf than pitcher. Its stem is solid and thick at ground level, then gradually opens out toward the top, trumpet-like, eventually reaching fifty inches in height. An extension on one side of the opening flares out, forming a lid, and here the leaf is heavily veined with red. Big clumps of these splendid greenish yellow traps grow in open marshes all through the South.

The coloring of the leaves of *Sarracenia drummondii,* a closely related species, is so unusual at first sight that one is inclined to assume it to be a sport of nature. They are shaped the same, though somewhat shorter than the yellow trumpets; but from green at the base they suddenly turn to dead, matte-white half way up and become reticulated at the top with blood-red veining. The tall-stemmed flower is a vibrant red.

The parrot pitcher-plant *(Sarracenia psittacina)* has very narrow, prostrate tubes which are equipped with a broad wing on the front, like the fin of a fish, and a round, little, puffed lid which fits so tightly around the opening that only the tiniest insects are able to work their way within to their destruction. The flowers are small and almost a black-red. *Sarracenia minor* has stocky, erect, fifteen-inch, yellow tubes, oddly blotched with white or pale yellow scars and helmeted in a curiously sinister manner like mediaeval knights. The flowers are shorter-stemmed versions of *S. flava.*

Sarracenias were everywhere—and not all were true to type. Intermediate colorations and sizes were fairly common. There were forms of *S. flava* with almost orange tones and of *S. psittacina* with larger, lighter flowers. One large group, near Wewahitchka, was of such definite form and color that it deserves special mention. The leaves were similar to those of *S. purpurea* but shorter and more urn-shaped in outline, rounder in cross section and almost totally unveined; the color rather that of a plum. The flowers, on foot-long scapes, were as large across as those of *S. flava,* but the color of the rounded petals was a vibrant, deep rose. Probably a hybrid, yet the loveliest sarracenia and one of the most artistically composed plants we have ever seen.

Among the other occupants of road margins the most common were *Sisyrinchium graminoides,* one of the blue-eyed-grasses, and related species, which formed solid beds of azure. *Salvia lyrata,* also blue-toned, was another decorative plant. The color was much deeper there than in our local form, sometimes appearing a deep blue. The species of *Aletris* we find most frequently in the North is the *farinosa,* white, but here the tall, narrow spikes were of beaten gold, that of *A. aurea.* And a verbena, *Verbena rigida,* matted large areas on the outskirts of villages with purple. Also forming numerous small clumps were the glowing pinks of various polygalas, such as *P. brevifolia* and *P. polygama; P. sanguinea, P. leptocaulis,* and *P. chapmani* appearing

earlier than with us and much pinker.

The early orchids were also in flower during our visit in April. *Calopogon multiflorum* displayed its cluster of shining cerise flowers. The hairy lip of this species is hinged and, acting like one end of a seesaw, tosses the alighting small insect over and onto the column where it carries out a forced but effective cross-pollination. *Amsonia ciliata* exists on somewhat higher, dryer ground. A close relative of the favorite garden plant, *Amsonia tabernaemontana,* it is somewhat more compact and has narrow leaves and trusses of clear, light blue flowers. In the same region *Ceanothus microphyllus,* like our New Jersey tea and the glorious West Coast shrubs, is a very pleasing subject. The typical airy cluster of tiny, pure white flowers is set off by a very dark green, microfoliage. A beautiful plant, well worth cultivating.

Here, too, is found the narrow-leaved pickerel-reed, *Pontederia lanceolata,* choking shallow marshy places and often turning from the typical blue-purple to a delicate pinkish white. The baptisias were also in bloom—not our small-flowered varieties, but tall plants, stately and handsome, with white and yellow flowers.

On grassy banks we saw *Anogra nuttallii* of the Evening-Primrose Family, but looking like a large-sized, delicate pink poppy. A large-flowered, magnificently blue skullcap, *Scutellaria floridana,* was growing among the grasses. The local lily at that time of year is the Atamasco, which is sometimes five inches across in this region. Its upturned, white flowers dot the grassy borders for miles. And in the wet fields among the pines were waving thousands upon thousands of *Zygadenus,* each white plume consisting of numerous blossoms.

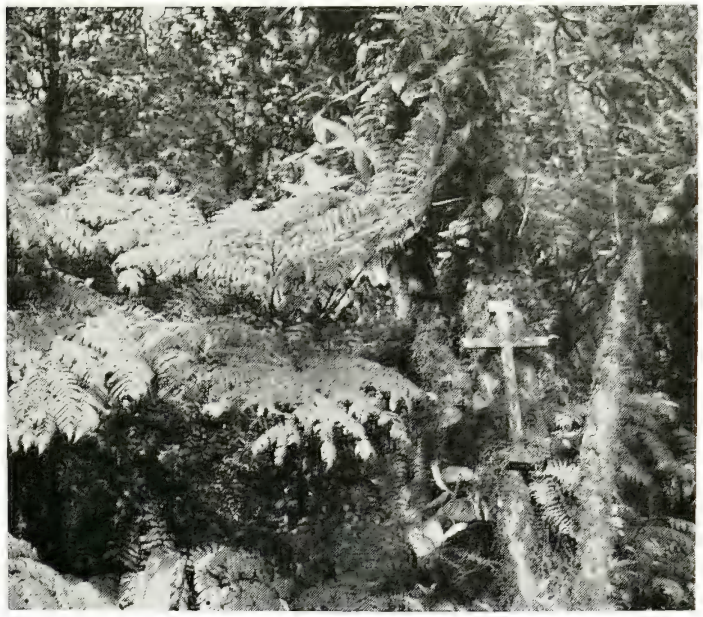
This wonderful region of gleaming white beaches, wonderful forest, and rich floral treasures will surely lure more and more lovers of nature as time passes.

HENNA (Continued from page 10)

mignonette or the mignonette-tree, because the flowers resemble those of the true mignonette (*Reseda odorata* L.). In Mexico reseda is used as a common name, and elsewhere the names of Indian privet and Egyptian privet are often heard.

Henna is usually seen as an upright shrub four to six feet high, but in India it is sometimes a straggling tree to twenty feet. Linnaeus named the genus after John Lawson who, in 1709, published an account of his adventures in North Carolina. These ended rather abruptly three years later, when he was burned at the stake by the Indians.

Dr. Menninger of Stuart, Florida, will send free seed of henna, *Lawsonia inermis,* to any one who may be interested. All that is necessary is that the request be accompanied by a stamped, self-addressed envelope.



The cross was placed as the "half-way mark" on the trail of a Soque pioneer who moved into the uninhabited rain forest of eastern Oax. This cloud forest location, at an elevation of four thousand feet, has an abundance of epiphytes and ferns. The large ferns at the left center are *Cyathea* sp.

This cross, above the village of Sto. Domingo Chontecomatlán, Oax., had been decorated with (wild) marigolds—"flor de muertos"—for the Day of the Dead. Note the painting on the cross.

WAYSIDE CROSSES IN SOUTHERN MEXICO

By THOMAS MACDOUGALL

Mr. MacDougall is again in Mexico, where he will gather study collections of plants, mammals, and reptiles for individuals and institutions.

THE WAYFARER in Indian Mexico will observe how closely associated the inhabitant is with his habitat: the ranch houses are primitive—usually a pole frame-

Upper left. In a pine-oak habitat at an elevation of approximately five thousand feet, near the Chontal village of Tenango, Oax., an orchid (*Epidendrum* sp.) offering has become established on the cross.

Upper right. Here on a shrine, along a path above the Soque town of Ocozocoautla, Chis., the offerings are flowering sprays of "chucumai," *Stryax argenteus*. The center tree trunk is also *S. argenteus*. The tree with furrowed bark, at the right, is known as "siete pellejos," said to resemble the skin of a very old woman.

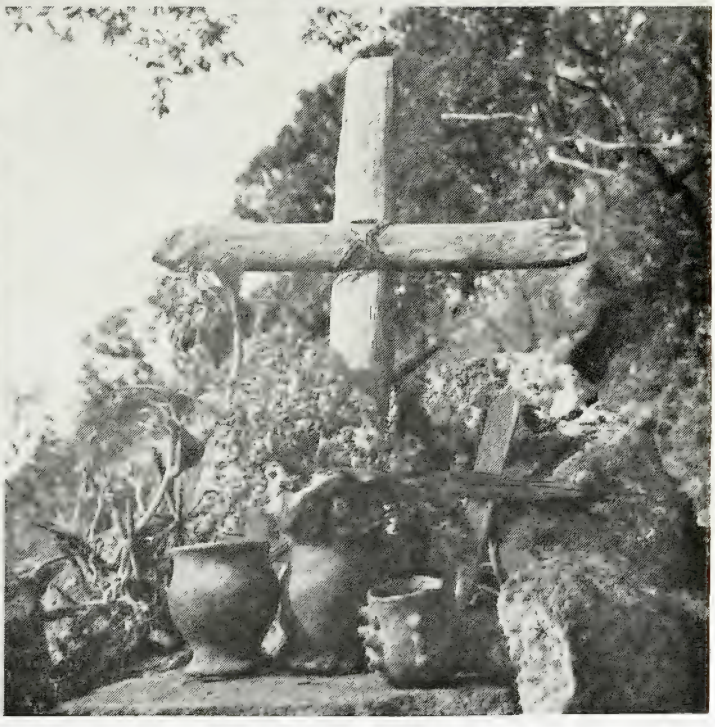
Lower left. On this cross at the top of a pass, forty-four hundred feet altitude, on the trail to the Mije village of San Pedro Jilotepec, are the flowers of *Arbutus* sp.; the vase is of a type found on pagan altars, the carved stone slabs are preColombian, and the tree is an oak.

Lower right, At an altitude of approximately nine thousand feet, above the Zapotec village of Macuiltianquis, Oax., this niche in a cliff has twigs of *Taxus globosa* and flowering sprays of *Sedum* aff. *dendroideum*. Daniel, a guide, led down a wooded stream to a yew with a trunk five feet in circumference, breast high.

work with adobe walls and grass- or palm-thatched roof —and blend into the environment.

Little crosses along the foot-trails are also completely harmonious, and they bear witness to the devoutness of the people. An added interest, for the botanically minded, is the local flora represented in the offerings. At times I find these to be a preview of nearby plant species.

The accompanying pictures were selected by the Editor of *The Garden Journal* from some thirty negatives. Most of them were taken in the State of Oaxaca; here the fourteen native races and fourteen or more native languages impart a uniquely Indian character.



Upper left. These white geraniums and a cross, on a dry wall in the Zapotec town of Ixtlán de Juarez, Oax., are of no significant botanical interest, but they make a pleasing picture.

Upper right. At the top of a climb, an elevation of almost six thousand feet, near Sta. María Nisaviguite, a Mije boy turns in reverence before this cross. The flowers at the base appear to be *Senecio* sp.

Lower left. The offerings on the cross, near the Chontal village of San Miguel Suchiltepec., Oax., include sprays and cones of *Pinus michoacána* and stones.

Lower right. This cross stands at a fork in the trail, more than six thousand feet above San Pedro Jilotepec, Oax. The orchid, at left, with pendant inflorescence is *Epidendrum arbuscula*. The pottery is that found on pagan altars of the Mije.

Right. Between Tonalá and Villa Flores, Chis., near the pass above Madre Mía at four thousand feet altitude, a natural shelf in a cliff serves as a shrine. Here the offerings include flowering *Senecio confusus*, sprays of *Eugenia* sp., and *Montanoa* sp. Hanging on the wall are fruits of "sandilleta" or little watermelon, *Pittiera longipedunculata*.

CONVERSATIONS ON ECOLOGY XIV

The first series of these informal exchanges was published in *The Garden Journal* in 1963 and 1964. Thirteen letters, bearing on the topic of *Vegetation Management,* were exchanged. They were reprinted in *Sarracenia* No. 9, 1965.

The second series, which is inaugurated in this issue, will concern itself with conservation organizations, with their goals, and with the coordination of their efforts. It will not attempt a systematic survey of all the public and private bodies which are specifically dedicated to conservation in its many forms, but I hope that the spokesmen for these organizations will acquaint us with their problems and will restate their objectives.

The first to do so (Letter XIV) is Ronald R. Dagon, at present my research assistant, who has seen service with the United States Fish and Wildlife Service, Department of the Interior, and with the Conservation Service, Boy Scouts of America, who is well read in conservation literature, and who has contributed reviews thereof to *The Garden Journal.* He addresses himself to Secretary of the Interior Stewart L. Udall, who has recently and so well restated the goals of conservation on this continent and elsewhere. The questions posed by Ronald Dagon all arise from Secretary Udall's concise and often dramatic statements. I believe they offer a number of cues to the leaders in the field. Udall's *The Quiet Crisis* has been reviewed by my collaborator, Virginia A. Weadock, in the November-December, 1965, issue of *The Garden Journal.* Pierre Dansereau

New York
November 9, 1965

Mr. Stewart L. Udall
The Secretary of the Interior
Washington, D. C.

Dear Mr. Secretary:

In the foreword of your book, *The Quiet Crisis,*[1] you state: "America today stands poised on a pinnacle of wealth and power, yet we live in a land of vanishing beauty, of increasing ugliness, of shrinking open space, and of an overall environment that is diminished daily by pollution and noise and blight." This, in brief, is the quiet conservation crisis of the 1960's.

It would appear to me that our crisis (and I say "our" because I believe that each of us must share a responsibility in all these matters) is far from silent and the noise level is increasing daily. One has only to look at the recent publicity in New York area papers for daily reporting on the controversy surrounding the proposed Consolidated Edison Company's power plant construction at the Storm King Mountain site on the Hudson River. You, of course, have already become involved in this specific program. In your letter to Dr. Albert Lamb (April 14, 1965)[2] you cite the Consolidated Edison case as ". . . a prime example of poor resource planning in that all of the options and alternatives were not considered and thoroughly analyzed." Perhaps the influence exerted by you and by others, such as the Scenic Hudson Preservation Conference, will result in the Federal Power Commission reconsidering its previous stand on the Storm King site, or perhaps the courts will see fit to check the tide of encroachment by power interests on major water sources under the guise of "public need" and "public good."

Personally, I should hope that the State of New York could shoulder the responsibility for the conservation of its remaining scenic and recreational areas. If the Executive Office and others, however, fail to accept this challenge (and it is often a challenge to buck the pressures exerted by dominant economic interests such as major power or mining concerns), then perhaps the Bill (H. R. 3012) introduced on January 18, 1965, by Mr. Ottinger to provide for the establishment of the Hudson Highlands National Scenic Riverway in the State of New York would become essential legislation. I do not subscribe to the theory that *only* the Federal Government has either the responsibility or the facilities to preserve or conserve our natural resources, but this is once again a situation where a senior agency must step in if a subordinate agency fails to meet its responsibilities. The failure at any given agency level can lead to irreversible destruction of a natural resource.

I did not mean to drift into the center of the Storm King issue in this letter, but it does serve as evidence that the "quiet crisis" is becoming somewhat more noisy.

The question then becomes: is the noise of these independent and often diversely motivated groups an effective force in shaping the philosophy and ultimate goals of our public agencies? Frequently, I am afraid, the answer to this question must be in the negative inasmuch as these separate factions seldom are willing to look any further than their own individual and selfish interests. Is there a spokesman who can unify the various sides of these complex and so often diverse splinter groups? Perhaps what is needed is the voice of an ecologist (or do I mean many ecologists?). Frank Egler has recently stated[3] that he envisions ". . . arising somewhere in this country a department, a center, or an institute of ecology that will take its place not only in the U.S.A., but in the world. By 'ecology' here I mean an ecosystemology, a science involved with the study of those complex 'webs'; of plants, animals, climate, soil, water, *and* man. A science that integrates into itself (and does not merely ape) the fields of psychology, sociology, economics, and politics." I would most certainly agree with Pierre Dansereau[4] that we do not need to coin a new term such as "ecosystemology." But call this science what you will, it responds to the need for unifying the concepts concerned with the cycling of resources and the effects of man upon those cycles. Many of us share Dr. Egler's hope that some time in the not-too-distant future a much-needed center of ecology will emerge, but I trust that in the meantime other significant steps will be taken by all who feel any sort of responsibility towards our natural wealth. Ecologists in particular should be the first to make themselves heard where it counts, to speak out from "inner sanctums" of learning, and to *become involved* in the issues of the day; they should not remain silent when the very resources they seek to understand are being destroyed or irreversibly altered, while they discuss among themselves (at semi-private meetings) the "ills" of the modern world.

Secondly, I should hope that the agencies charged with these vast responsibilities would take greater advantage of the ecologically oriented talent available to them and further, and perhaps even more importantly,

would outline for public scrutiny their ultimate goals.

In giving the 1964 H. M. Albright Conservation Lectureship,[5] E. Max Nicholson pointed out that man's "... new evolutionary vehicle is as yet far from stable or well-integrated, and that it is being directed on a collision course *vis-à-vis* nature." Mr. Nicholson describes our current struggle in conservation as "... a kind of free-for-all guerilla warfare against nature ..." and asks the most probing of questions: "How can we bring about a new relationship between man and his natural and social environments?" Continuing to probe, he asks where the responsibility lies, if ecology has been properly emphasized, and if the conservationists have failed to support the ecologists, and, if so, where have these failures occurred? He feels that there has been a breakdown of communication due in part to a real language barrier and to a lack of understanding of the role of ecologists by non-ecologists (a view previously discussed in this journal by John Milton[6]), a real failure of ecologists to attract and train good men, and a real failure of ecologists to sell (yes, sell!) their services to the people who need them most. This is what I mean by "speaking out," by "becoming involved," and by "selling a service."

Recent exposure to a variety of graduate students participating in a course on the fundamental dynamics of plant and animal communities has convinced me that most of our current graduate students cannot even define ecology, let alone have any idea of what ecologists do. Doesn't this lag in knowledge imply that the students of anthropology, geography, and, yes, even biology are not being reached by the ecologists? How is the field of ecology to attract capable young people to a discipline which to many does not even exist? Must not the agencies that will require their services do more than provide lip service and money? Must they not further provide the incentive to these young people to enter the very field in which they ultimately will discover their vocation?

One of the principal contributors to these failures must be the complexity (and sheer numbers) of the agencies charged with the responsibilities of preservation, conservation, and recreation. There are, of course, a variety of reasons for this, and one must always consider that many of these agencies were not in the business of either conservation or recreation when they were created. For years, and to this very day, coordination between these federal agencies has been non-existent and the gap between the motivation, and, even more significantly the long-term goals, of private, state, and federal agencies has been even wider. A more active participation in recent years at the executive level of our Federal Government has helped somewhat. I am thinking here of such programs as the President's Recreation Advisory Council, of which you were chairman during its first two years. Many of us talk of the increasing population pressure, for example, yet few of us seriously face its dramatic implications. It is a good sign that people like yourself show the foresight to "save us from ourselves," but I cannot help feeling that you and others in significant positions of influence must go even further.

Returning to your text, *The Quiet Crisis,* you state: "In Alaska we have a magnificent opportunity to show more respect for wilderness and wildlife values than did our forebears. The wonders of the wilderness still abound there; if we spoil them, we cannot excuse their defilement with pleas of ignorance." Yet the resources of Alaska, to all outward appearances, will go the way of the rest of our native wealth if a more positive stand is not taken, not by those who wish merely to *preserve,* but by those who wish to *conserve.* At the state and federal levels Alaska has some of the most competent and dedicated field biologists to be found working anywhere, but their influence alone cannot win any major battles in Mr. Nicholson's war. Alan Cooke has summarized some of the highlights of the Rampart Dam Proposal for the Yukon River[7] and has pointed out the difficulties in achieving objective judgments concerning such a project (a difficulty certainly not limited to the Rampart Dam). I have seen the Yukon Flats and know that they are not, to use Cooke's words, a sterile wasteland, but a productive wildlife area. I have seen the fishwheels working and have wondered about a species of salmon capable of swimming upstream in so mighty a river system to spawn in its upper tributaries in Canadian territory. Another major point in Cooke's review is the issue of land ownership and the natives of Alaska; but when one considers our nation's previous treatment of native populations and our previous record on problems of land ownership, the native Alaskan living in the Fort Yukon has cause to be a pessimist of the highest order.

You also suggest in your text that cities with populations of from thirty thousand to three hundred thousand might provide the solution to accommodation with undue crowding. Unfortunately, I see in various press releases that the city of Anchorage, already hard-pressed for space, might attempt to solve its problems—with the apparent blessings of Senator Ernest A. Gruening and others — by utilizing portions of the National Moose Refuge. The exploitation of oil within the refuge was handled in an admirable fashion, but how housing and a refuge for moose can be reconciled on the same terrain escapes me! I have nothing but the deepest respect for the pioneering efforts of Senator Gruening and his past accomplishments for the Territory and now for the State of Alaska, but where is the line of conservation versus total exploitation to be drawn, and *by whom*? These are the types of conflict which I find difficult to resolve. For instance, do the goals outlined in your text conflict with the actual philosophies of the Department of the Interior? I imagine that they do not, and I interpret the recent appointment of people like Dr. Stanley A. Cain of Michigan as a sign that the gap between those charged with management and those concerned with the very fundamentals of ecology is closing.

There are other questions which come quickly to mind as I ponder my own future, the future of ecology, and the future of our natural resources. Are conservationists merely providing a stopgap operation which will eventually succumb to an overwhelming world population? Is the pressure of economic need in the future go-

ing to permit the further exploitation of what we now consider natural areas? Are the efforts of the smaller private agencies to establish plant and animal sanctuaries a futile effort in conservation (or preservation)? Are economic considerations always to be the final guideline in reaching a decision once the battle lines between conservation and exploitation are drawn? Are the training programs set up by our conservation (or management) agencies realistic in terms of the recreation demands being placed upon them? Is the plea for an increase in conservation education and educators mocking the reality of our rapidly dwindling natural resources? Do you feel that there is a national interest in the wise use of our remaining natural resources? Or is the flurry of present conservation activity merely a regional or local phenomenon?

One can only admire the efforts of Senator Frank Church and others in introducing Bill S-1446 to establish a unique Wild River System, which would include six and perhaps as many as fifteen rivers, even portions of the Hudson in New York. These rivers represent only a fraction of our system of waterways, but the action is a start. The question again becomes: where does this program end? The recently enacted legislation to beautify our nation's highways falls into the general area of conservation, as do the more obvious and long-sought measures such as the now-passed compromise Wilderness Bill. Do these bills and others in this bubbling stew-pot of conservation and management have a central theme? Is there a time-table for the expected passage of critical legislation? Is an individual agency still involved so deeply in its own budget requirements that projects depend not on necessity but on the ability of an agency to survive in the scramble for its share of a larger departmental budget? After many years of lack, the National Park Service is beginning to undertake research into its own parks system! Although this is another encouraging sign in this so-called age of space, it would be interesting to compare the cost of a single-engined jet aircraft to the research budget of the National Park Service.

What is the long-range planning which will eventually overcome the paradox of millions of available recreation acres failing to meet the needs of the public for outdoor recreation opportunities? The 1962 report to the President by the Outdoor Recreation Resources Review Commission[8] was an excellent example of the type of guidelines which can and must be established in all areas of natural resources. But these guidelines must not be established to the exclusion of other agencies which may be concerned either directly or indirectly with the same natural resource. The question might probe even deeper: does the establishment of a Great Basin National Park, a Sawtooth Wilderness National Park, and a Guadalupe Mountains National Park fit a master plan to provide us eventually with the diversity, quantity, and quality of National Parks we need and desire? Even more significant might be the future of the control of predatory species, another area in which objective judgment seems to have been sadly lacking; yet the debate without positive action continues.

This letter is directed to you, because you have shown the courage to speak out on the need for increased concern and communication in the field of general conservation. It is not intended to criticize any particular individual or agency, but is a criticism of the general lack of continuity in conservation planning based on sound ecological principles. With the multitude of agencies currently engaged in conservation activities, don't you agree that greater coordination of effort in terms of effective long-term planning is a necessity? Isn't the first step a systematic inventory of our natural resources and the rate of their withdrawal from the present supply? Isn't a fundamental prerequisite of successful long-range planning an understanding of the principles involved in this great variety of plant and animal communities and in their environmental controls? And isn't this the realm and the responsibility of the ecologist? Earlier, I said the ecologist had "to sell"; Dr. Dansereau says "to give"; but isn't the significant feature the fact that the fundamental information must be identified and placed into the hands of the appropriate agencies regardless of whether or not a "selling" job on the part of ecologists is required to implement the program?

I am afraid that the tremendous demands on your time will hardly allow you to answer this letter. But I do feel it is proper to direct it to you as the first among those charged with a major responsibility for conservation policy.

The late President Kennedy made his plea in a far more eloquent manner than I can in his introduction to your text: "We must develop new instruments of foresight and protection and nurture in order to recover the relationship between man and nature and to make sure that the national estate we pass on to our multiplying descendants is green and flourishing." I could not agree more or with deeper conviction, and I can only hope that those of us who may have an opportunity to aid in meeting this challenge can find the courage and motivation to become involved.

Sincerely yours,
RONALD R. DAGON

REFERENCES

1. *The Quiet Crisis*. Stewart L. Udall. Holt, Rinehart and Winston, New York, xiii + 209 pp. (illus.). 1963.
2. Scenic Hudson Preservation Conference. Bulletin No. 5, May 3, 1965.
3. Conversations on Ecology II. Frank E. Egler. The Garden Journal, **13**(3): 63-65. 1963.
4. Conversations on Ecology XIII. Pierre Dansereau. The Garden Journal, **14**(6): 233-235. 1964.
5. The Horace M. Albright Conservation Lectureship. IV. Conservation and the Next Renaissance. E. Max Nicholson. School of Forestry, University of California, Berkeley, March 4, 1964, viii + 20 pp.
6. Conversations on Ecology XI. John Milton. The Garden Journal, **14**(4): 148-150. 1964.
7. The Rampart Dam Proposal for Yukon River. Alan Cooke. Polar Record, **12**(78): 277-280. September, 1964.
8. Outdoor Recreation for America. A report to the President and to the Congress by the Outdoor Recreation Resources Review Commission. U. S. Government Printing Office, Washington, xiii + 246 pp., January, 1962.

GUATEMALAN REFLECTIONS

By LUCIA M. ANDREWS

Mrs. Andrews, who has contributed previously to *The Garden Journal,* was a member of the Garden's Guatemala Tour.

OVER GUATEMALA we descended through steel-colored sky caverns walled with white cloud and glided into luminous grayness which enveloped the great plane like a caul. We waited for the mystery of Guatemala to unfold before us.

Guatemala City is handsome and modern. Its avenues are wide and tree-lined, planned for space and shade. Statued plazas and fountains make park areas. New banks built in avant garde style and first-class modern hotels are worthy of the nation's capital.

The seat of government and focus of civic pride is the National Palace—new, 1943, immensely expensive, vast and ugly. It epitomizes the mixture of cultures—Spanish-Catholic tradition superimposed on the ancient Mayan and primitive Indian foundations. Crystal chandeliers, huge enough to cage a lion, hang from polychromed wood ceilings; stained glass windows of saints and conquerors are set with mural paintings of naked Indians around their camp fires. I was glad of the touch of natural beauty given by the magnificent plants in the enclosed courtyards. Even in its ostentation and bad art, the National Palace does represent the varied and often conflicting elements which made up Guatemala in the past and which pose its most serious problems today.

Along the broad streets, usually behind high walls, are beautiful homes and gardens owned by charming and hospitable people, many of whom entertained our group.

The National Museum of Archaeology and Ethnology is an impressive, white building in a modern interpretation of Spanish-baroque. It houses fine exhibitions of ancient Mayan stelae and superb pottery; also costumes and fabrics of the different Indian tribes. Some embroideries were so lovely in color and design that I longed to sharpen my needle and try to copy them.

The nursery and plant collection of a distinguished naturalist, Dr. Mariano Pacheco Herrarte, is located in the center of the city. Squeezed in behind high walls, it is a group of gray, wooden buildings and a maze of open courtyards filled to overflowing with interesting plants. Also there are large cages with multicolored birds twittering and chirping to the tourists who twittered and chirped at them.

Dr. Mariano is a small, weathered octogenarian who does not speak English, but his bright eyes conveyed his hospitality. He lives there with his great array of orchids, a group of succulents from both the New and Old Worlds, palms, cycads, epiphytes, and countless other valuable plants. "So many little things!" one lady remarked—and I thought the owner was the prize of the collection.

OUT ON THE ROADS

What fun to hear the plant talk and botanical arguments as we traveled! I tried to learn so much so fast and at the same time to take in picture after picture of magnificent scenery.

We drove through hundreds of acres where coffee is cultivated under "mother trees" of *Inga edulis* or *Grevillea robusta,* the Australian silk-oak. We passed living fences of *Erythrina berteroana,* the coral tree; picturesque thatched huts huddled in green valleys; incredibly steep hillsides planted to wheat or corn.

The point overlooking Lake Atitlán climaxed one

Fifty-one members of the Garden and three of its staff took the Guatemala Tour which, besides botanizing and sightseeing, included visits to twenty-four private gardens and estates, entertainment at six teas and cocktail parties and two dinners, and attendance at eight botanical lectures. Tour leader Phil Clark is in the center foreground; Dr. and Mrs. William C. Steere wave from the top of the ramp.

Orchid corsages were pinned on all the women of the Garden's Guatemala Tour at the airport departure. Phoebe Radcliffe, Garden Membership Secretary, gives Mrs. Hal Trueman Beans her corsage. Alvin Devereux is in the background.

drive, and the weather blessed our view with clear skies and sunshine. Three great volcanoes unveiled all but their actual craters, as drifting mists rose in the breeze like evanescent ghosts above the wide, blue lake far below.

Cameras clicked like typewriters in an office. "Stand there, dear, right in front of the volcano." "30 will overexpose in this light." "There's the town, way down there." "It's Switzerland in the tropics."

Up and down steep grades, through narrow ravines, along edges of precipices, the car was a moving point on many a close parabola, and I wondered at moments if we might spin off on a tangent to infinity!

The roads are often bounded by high cut banks of clay and rock grown over with plants and flowers. Here we found the endemic *Pinguicula morelense,* a butterwort of deep violet color. Several melistomes are quite common. *Heterocentrum fragilis* looks like apple blossoms in shades of pink, white, and red—that is, if you don't look closely at the parallel veining of the leaves and the sickle-shaped appendages on the stamens! There are dozens of species of *Desmodium,* quite different from our common tick trefoil. The composites, which we know as herbs, are here in many woody types, tall, treelike shrubs, some with large, striking yellow blooms as *Tithonia longiradiata;* some with smaller, yellow flowers in clusters such as *Zexmenia frutescens* and *Verbescina; Baccharis* and *Vernonia* grow larger than lilac bushes and the most exciting are the dahlias. The tree dahlias *(D. maxonii)* are commonly single, lavender flowers, but they grow in great masses of color and often in delightful juxtaposition with groups of yellow. There are many mimosas, pink and white, and startling notes of clear red in members of the *Rubiaceae* and *Gentianaceae*; purple and blue salvias; such mosses that Dr. Steere says he has to close his eyes to pass by!

We left on one clear, crisp morning which made every available sweater a necessity, but within two hours we had coasted down the mountain curves to a level road through the Pacific lowlands. The pines and oaks were left behind. We drove past fields of sugar cane and great kapok trees *(Ceiba pentranda)* which stood like lonely giants in the open or towered above woodland companions of Spanish-cedar *(Cedrela odorata),* fig (*Ficus* sp.), mahogany *(Swietenia humilis),* and tropical birch *(Bursera simaruba).* The air was hot and the heat was welcome, but we climbed again that evening to Antigua.

The Indians

I've seen Indian faces which might have belonged to the great Mayan rulers—high cheek bones, fine modeling, and clear skin of polished brown, and with it all an impassivity when their faces are at rest which implies generations of accepted suppression.

I most admire the women. Their garments, even when patched and tattered, are full of color and woven in designs which indicate their tribal affinities. Around their shoulders they wrap a wide, striped shawl, a *rebozo,* and bound into the shawl are their babies and their bundles. Such bearers of burdens, these women! They carry large baskets filled with fruit or clay urns full of water, balanced on their heads as nonchalantly as we tuck a handbag under our arm. They walk with ease and grace, their backs straight, their necks erect and rigid, but their faces are old at thirty!

The men are small in stature. We saw them plodding five miles up a mountain to their home village after a long day's work on the road. On their backs, supported by a tumpline across the forehead, they bore loads of split firewood or nets full of farm produce, corn or cabbages.

Backwardness and poverty were evident in the market at Sololá. Crowds of Indians, sitting on the cobblestoned street, surrounded by baskets of vegetables, mounds of pottery, scrawny dogs, begging children. Pictures everywhere—the symmetrical volcano framed by the street scene, the park with its flowers and spreading shade trees, the green-walled constabulary, where a line of the ailing waited for the clinic to help them.

At Chichicastenango the Indians seemed more prosperous and happier. A crowd of colorful people thronged the large market place, where booths had been set up by stretching canvas on poles. Food and wares of many kinds were on display.

A flight of rugged stone steps leads from the market plaza up to the white Spanish facade of the old church of Santo Tomas. On these steps Indian men were burning copal incense, and the spicy fragrant smoke wafted their prayers to their tribal gods. One or two medicine men or witch doctors were among the worshippers.

As I entered the side door of the church from a walled courtyard, the magic of the place seized me. At first the interior seemed dark after the bright outdoors, but, momently, I realized the indirect light from high windows and from the main doors which filtered in grayish beams through the haze of fragrant incense and candle smoke. The stone floor was worn and irregular beneath my feet, and far away to my right a silver altar and reredos gleamed against the dark wall. A few rows of plain wooden benches faced the altar, but these were unoccupied.

In a row down the center of the church were low, rectangular, wooden platforms three or four inches high. They were covered with flower blossoms and studded with flickering candles, like a procession of mammoth birthday cakes. The flowers were mostly marigold heads —we had seen them sold in bushel baskets in the market—they are particularly the flowers of the dead. They added their pungency to the aromatic atmosphere. A soft vibration of sound filled the church, a low humming undertone of murmured prayers, offered by the Indian men who knelt on the rough floor, bowed over the simulated graves. They were invoking the spirits of their dead, praying for them and to them in the life beyond. The men are allowed to make the prayers, the shawled women stand in the shadowed background. Except the widows, whose prayers are also acceptable to the Great Spirit. I was a widow and I prayed too, feeling as never before the universality of man's longing for the divine—pagan and Christian, all yearning for the ultimate mystery.

COURSES, LECTURES AND OTHER GARDEN EVENTS

(For detailed information about a particular event or course, write or phone LU 4-8500)

ILLUSTRATED LECTURES on January 6, 13, 20, 27, 1966, at 11 a.m., in the Cosmopolitan Club.

TREES AND SHRUBS IN WINTER (eight weekly sessions)—10 a.m.-12 noon. Starts January 8, 1966, Museum Building. Instructor—Eleanor Yarrow.

APPLIED ECOLOGY (eight weekly sessions) —Monday morning class, 10-11:30 a.m.; Monday evening class, 8-9:30 p.m. Starts January 10, 1966, Museum Building. Instructor—Dr. Pierre Dansereau.

FLOWER AND VEGETABLE GARDENING (eight weekly sessions) — Thursday morning class, 10-11:30 a.m.; Thursday evening class, 8-9:30 p.m. Starts January 13, 1966. Museum Building. Instructors—Paul F. Frese and James M. Gibb.

HOUSE PLANT SHOW IN THE CONSERVATORY—January 22-March 21, 1966.

LANDSCAPE GARDENING (seven weekly sessions)—Tuesday evening class, 8-10 p.m. Starts February 8, 1966. Museum Building. Instructor—Arthur Murphy.

LANDSCAPE GARDENING (seven weekly sessions)—Thursday evening class, 8-10 p.m. Starts February 10, 1966. Museum Building. Instructor—Arthur Murphy.

VALENTINE SHOW IN THE CONSERVATORY—February 12-27, 1966.

ORNAMENTAL PLANTS AND THEIR USES, In-Service Course for Teachers (spring term)—3:45-5:25 p.m. Starts February 16, 1966. Museum Building. Supervisor —Elizabeth C. Hall.

"PLANTS AND GARDENS OF THE FAR EAST," illustrated Saturday Afternoon Lecture by Elizabeth Scholtz on February 19, 1966, at 3:15 p.m., Auditorium of the Museum Building. Preceded by a half hour of recorded music.

"HERE AND THERE IN THE ROCKIES," illustrated Saturday Afternoon Lecture by Dr. Herman F. Becker on February 29, 1966, at 3:15 p.m., Auditorium of the Museum Building. Preceded by a half hour of recorded music.

DESIGNING THE HOME GROUNDS (six weekly sessions) — Wednesday morning class, 10 a.m.-12 noon. Starts March 2, 1966. Museum Building. Instructor—Alice Dustan Kollar.

"A RECENT TRIP IN RUSSIA," illustrated Saturday Afternoon Lecture by Dr. Theodore Kazimiroff on March 5, 1966, at 3:15 p.m., Auditorium of the Museum Building. Preceded by a half hour of recorded music.

TROPICAL GARDEN—an exhibit by The New York Botanical Garden at the International Flower Show, Coliseum, 59th Street and Columbus Circle, New York, March 5-13, 1966.

CHILDREN'S OUTDOOR GARDENCRAFT (spring and summer 1966). Saturday classes, 9:30 a.m.-12 noon, from March 5 until end of school year, then two week-day mornings through summer. Instructors—Lillian Weber, Nancy Callaghan, Hetty Everett, Agnes Faithorn, Robert Russo.

SPRING SHOW IN THE CONSERVATORY, March 6-20, 1966.

"IRELAND'S COUNTRYSIDE AND PEOPLE," illustrated Saturday Afternoon Lecture by Mrs. Anne Neylon on March 12, 1966, at 3:15 p.m., Auditorium of the Museum Building. Preceded by a half hour of recorded music.

SATURDAY AFTERNOON NATURE WALKS, March 12-June 25, 1966, 1:30-3 p.m. Start from Museum Building. Leader—Mrs. Eleanor Yarrow.

Admission to Saturday Afternoon Lectures, 25 cents, free to members of the Garden (upon presentation of membership card).
Nature Walks, fee $1.00 per person.
For fees of the various courses, see the Educational Program.

NEWS, NOTES and COMMENTS

Activities of the Director and Staff. Dr. William C. Steere, Director, attended a meeting at Cherry Hill, New Jersey, on November 22 and 23, 1965, on Communications Study for Biology. The meeting was organized by the Board of Trustees of *Biological Abstracts,* of which Dr. Steere is President, and sponsored by the National Science Foundation. On December 2, 1965, he attended the annual dinner of the American Geographical Society in New York City, at which he accepted the David Livingstone Centenary Medal on behalf of Dr. Bassett Maguire, Head Curator and Coordinator of Tropical Research, who was then on an expedition in South America. Dr. Steere was guest at the annual Senate Dinner of Phi Beta Kappa in Washington, D. C., on December 3, 1965, at which the Phi Beta Kappa Award in Science for an outstanding contribution to the literature of science was presented to Dr. Donald R. Griffin, Professor at Rockefeller University, for his book *Bird Migration.* Dr. Steere was Chairman of the Award Committee which screened the entries and made the selection. On December 8, 1965, he delivered a lecture on mosses to the Garden's In-Service Course for Teachers and on December 14, a lecture on "Arctic Flowers and Their Relatives in Your Garden" to the Adult School of Bronxville, New York, as part of its course in practical gardening; on December 16, he participated in the dedication of the new Harriet Barnes Pratt Library Wing at The New York Botanical Garden; and on December 26-31, Dr. and Mrs. Steere attended the annual meetings of the American Association for the Advancement of Science at the University of California, Berkeley.

Dr. Pierre Dansereau, Assistant Director (Botany) participated in a symposium on Teilhard de Chardin at Seattle University, October 12 and 13, 1965, during the inauguration of Father Fitterer as President. He lectured at the annual convention of the deputy ministers and directors of the provincial and federal parks in Ottawa, Ontario, on October 21, 1965.

Dr. H. W. Rickett, Senior Curator of Botany, explored Hadrian's wall in Northumberland, England, the last of October and on November 3, 1965, consulted at the British Museum on nomenclatural matters. He reports that Charles Johnson returned from a trip to the Southwest with his largest "take" yet for the Wild Flower Books—five hundred and fifty fine photographs.

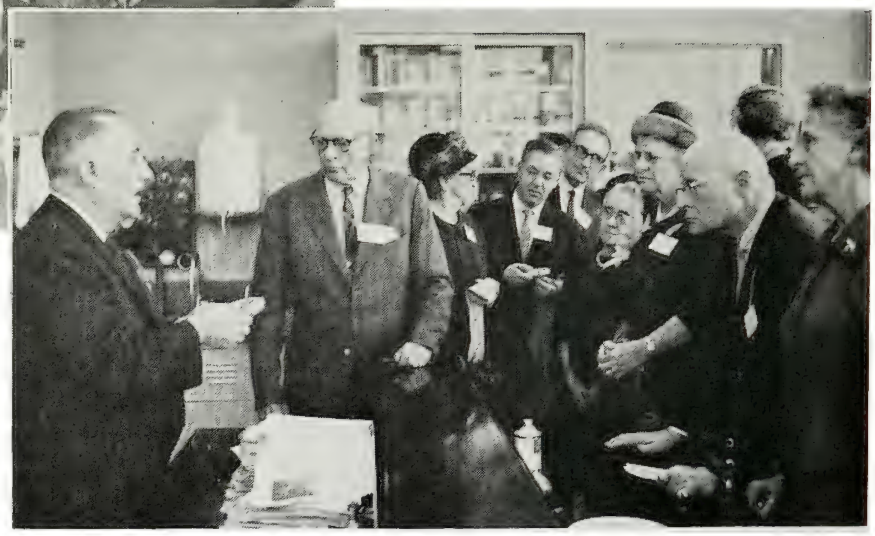
Dr. Tetsuo Koyama, Associate Curator, and Mrs. Koyama attended the celebration at the Smithsonian Institution, September 20, 1965, on the occasion of its publication of *Flora of Japan* in English. Dr. Koyama spoke on the background of the Japanese edition on which the English version is based. While in Washington, D. C., he translated a Japanese lecture into English at the United States National Arboretum. The lecture, "Japanese Cherries, Classification, and Phylogeny of Some Representative Species," was given by Dr. Jisaburo Ohwi, a research scientist at the National Science Museum, Tokyo. On October 21, 1965, Dr. Koyama lectured on historical plant geography, with special reference to the Arcto-Tertiary elements, at City College of New York.

Dr. Trevor McMorris, Research Associate, attended the autumn, 1965, meeting of the Chemical Society, London, held at the University of Nottingham, September 20-23, 1965.

Rupert C. Barneby, Honorary Curator of Western American Botany, returned the fore part of November from a five-week trip to Durango and Michoacán, Mexico. He collected seventy-two species, of which perhaps three are undescribed, in connection with a projected revision of the genus *Dalea.*

Leo Parisean Medal to Dr. Dansereau. On November 6, 1965, Dr. Pierre Dansereau received the Leo Parisean Medal and Pfitzer Prize awarded by the Association Canadienne-Francaise pour l' Ad-

Dr. William C. Steere, the Garden's Director, Mrs. David Rockefeller, member of the Board of Managers, Dr. A. I. Virtanen, Director of the Biochemical Institute of Helsinki, Finland, and a Nobel prize winner, seated at the luncheon table; standing, Mrs. Arnold Whitridge, Chairman of the Science Luncheon Committee, and Mrs. Hermann G. Place, Vice President of The New York Botanical Garden, at the microphone.



Dr. Detlev W. Bronk, President of Rockefeller University, Dr. Steere, Director, and Dr. Williams J. Robbins, Director Emeritus of the Garden.

Dr. P. P. Pirone, Senior Plant Pathologist, explains the work of his laboratory to members of the Advisory Council and their guests.

vancement des Sciences. This medal, named in honor of Dr. Leo Parisean, the Association's first president, is given each year to a scientist in acknowledgement of his contribution to science. The Pfitzer Prize accompanies the medal.

David Livingstone Centenary Medal to Dr. Maguire. At its annual dinner on December 2, 1965, The American Geographical Society awarded the David Livingstone Centenary Medal, which is given "for scientific achievement in the geography of the Southern Hemisphere" to Dr. Bassett Maguire. In his letter of citation, Dr. Walter A. Wood, the Society's President, said that Dr. Maguire was being honored for his "distinguished contribution to our botanical and ecological knowledge of tropic America."

Prominent Scientists were entertained at a luncheon at the Garden on October 19, 1965, by the Advisory Volunteers. Dr. Detlev W. Bronk, President of Rockefeller University, gave the principal address, and Dr. William C. Steere, the Garden's Director, introduced the staff of the Research Laboratory. Each guest received *Research up in the Bronx,* written especially for the occasion by Samuel W. Lambert, Jr., M.D., from which we quote:

"What is research and should a botanical garden undertake it, or should it be confined to universities, giant corporations and government? To answer the first, Mr. Webster defines research as 'Studious inquiry; usually critical and exhaustive investigation or experimentation having for its aim the revision of accepted conclusions in the light of newly discovered facts.' And this also answers the second. The facilities at The New York Botanical Garden are excellent with its enormous special collections of plants, both living and dried, which only a few of the larger of the universities are able to afford; with their valuable collection of molds which must be kept alive and which very few other institutions own; with their new and very adequate modern physical plant and their staff of satisfied, competent workers. Another very evident reason why the Botanical Garden should conduct research is the willingness of the National Science Foundation, the National Institutes of Health, and other agencies to support generously the research activities of the Garden. Size alone is not one of the best criteria for successful research nor is magnitude of budget. Granted that nuclear fission could probably never have been achieved without the enormous resources of a generous government, such feats as the isolation of insulin by Doctors Banting and Best, carried out at a comparably infinitesimal cost, have undoubtedly been of far more benefit to the human race. Therefore it would seem that any research which is not wasteful and which is conducted under intelligent and well-controlled circumstances, whether in a large modern facility or in a shabby room, may fulfill the aims and hopes of those who are involved."

Dr. George Bistis, Assistant Professor of Biology at the College of the City of New York, formerly Research Associate at the Garden, spoke on "Dikaryotization in Basidiomycetes" at the seminar for staff and students on October 18, 1965.

Rev. Vincent T. O'Keefe, former President of Fordham University and a member of the Board of Managers of The New York Botanical Garden, was appointed assistant to the Superior General of the Society of Jesus in Rome. He has been succeeded at Fordham University by the Rev. Leo McLaughlin. Rev. McLaughlin also replaces Father O'Keefe on the Garden's Board of Managers.

Two Visitors from Japan. Dr. Misao Tatewaki and Dr. Jisaburo Ohwi, leading Japanese botanists in ecology and floristic studies, respectively, were among the invitees to the bicentennial celebration of the Smithsonian Institution. They visited the Botanical Garden after the celebration.

Dr. Tatewaki, now Professor Emeritus at the Botanical Institute, Hokkaido University, is a world-famous plant geographer and ecologist. Several years ago Dr. Tatewaki, then Director of the Hokkaido University Botanical Garden, invited Dr. William C. Steere, the Garden's Director, to Hokkaido, Japan, for his advice as to whether the Nopporo National Forest in Hokkaido be preserved under the designation of one of the Japanese wild preservation areas. Through the influence of Dr. Steere's professional opinion and evaluation, the Nopporo Forest was then added to the wild reservation areas under protection of the Government of Japan. This time Dr. Tatewaki returned Dr. Steere's visit to his home province by visiting the

Dr. Misao Tatewaki (center), when he visited the Montgomery Conifer Collection, was guided by John Swan, Foreman of Gardeners. Dr. Tetsuo Koyama, Associate Curator at the Garden, is an interested observer.

Dr. Jisaburo Ohwi (left) examines the specimens of Chinese cherries in the Herbarium with Dr. Koyama as his interpreter.

Botanical Garden at Dr. Steere's invitation.

Dr. Tatewaki spent one day of his five-day stay in New York in observation at the Botanical Garden. He highly admired the Propagation Range, Native Plant Garden, and the Library. He was most impressed by the Montgomery Conifer Collection, particularly with its completeness and excellent care.

Dr. Pierre Dansereau, Assistant Director, (Botany) and an old friend of his, took Dr. Tatewaki on a tour to the Audubon Center, Connecticut, while Dr. Tatewaki and I went on a field trip in the Interstate Park area with Gayle Jones, a graduate student at the Garden.

Dr. Jisaburo Ohwi, Director of Library and Research Officer at the National Science Museum, Tokyo, is a plant taxonomist and the author of the *Flora of Japan*. He represented his institute at the Smithsonian's celebration and was honored by the Smithsonian Institution for his *Flora of Japan*, of which the English translation has just been published by the Institution.

Dr. Ohwi, who was also invited by Dr. Steere to visit the Botanical Garden, spent most of his two-week stay in the Phanerogamic Herbarium, studying with me various Chinese specimens, most of which were accumulated by the late Dr. E. D. Merrill and his associates. Mulford Martin and John F. Reed showed Dr. Ohwi the new set up of the Library, which won Dr. Ohwi's great applause for its exhausive collection of Oriental botanical references.

T. KOYAMA

Other Visitors to the Garden. Dr. Andres Soriano, Director of the National University Library, and formerly Director of the National University Museum in Bogata, Colombia, visited the United States as a participant in the Foreign Leaders Program, Bureau of Education and Cultural Affairs of the United States Department of State, to study museum administration and library organization methods and techniques. He spent a day in October, 1965, at the Garden. Robert F. Kolkebeck, Assistant Director (Administration), showed Mr. Soriano all the points of interest and discussed administrative matters; then John Reed, Curator of the Library, showed him the Library and explained library methods and techniques.

Dr. David M. Gates, Director of the Missouri Botanical Garden, visited the Department of Ecology on October 5, 1965, and on that day addressed the seminar for staff and students on "Energy Exchange in the Biosphere."

Jamel Nuristani, a 1959 graduate of the Faculty of Science of Kabul University in Afghanistan and an assistant in the Science Department of the Afghanistan Institute of Education, visited the Garden in the fall of 1965, especially to observe the Garden's programs for school children. Mr. Nuristani, who arrived in this country in July, 1966, under a scholarship for graduate training through the Agency for International Development, has completed studies for an M.S. at the State University College in New Paltz, N.Y.

I. John Bassett and K. W. Specer, Plant Research Institute, Department of Agriculture, Ottawa, Canada.

Jeanne H. Goulding, Cheeseman Herbarium, Auckland Museum, New Zealand.

Oswaldo Boelcke, Facultad de Agronomia y Veterinaria, Buenos Aires, Argentina.

Elizabeth C. Hall, Associate Curator of Education, and Jamel Nuristani talk with Dr. Harold N. Moldenke, Director of the Trailside Nature and Science Center at Mountainside, New Jersey, in a classroom at the Garden. Dr. Moldenke gave the fall 1965 course in systematic botany.

Dr. Steere, the Garden's Director, and Dr. Daniel M. Gates, Director of the Missouri Botanical Garden, at the entrance to the Research Laboratory Building.

Frank Valles, Biology Department, College of Agriculture, Mayaguez, Puerto Rico.

F. Vrugtman, L. H. Bailey Hortorium, Ithaca, N. Y.

Ina Vrugtman, Department of Floriculture and Horticulture, Ithaca, N. Y.

Dr. B. Boivin, Department of Agriculture, Ottawa, Canada.

Sister Elizabeth Henry Bellmer, Department of Biology, Trinity College, Wash.

Dr. G. B. Marini Bettolo, Director, Instituto Superiore di Sanita, Rome.

Dr. Victor M. Badillo, Facultad de Agronomia, Maracay, Venezuela.

Eugene C. Ogden, New York State Museum, Albany, N. Y.

Dr. John J. Wurdack, Department of Botany, Smithsonian Institution, Washington, D. C.

Dr. Arturo Gonzales-Mas, University of Puerto Rico, Mayaguez, P. R.

Robert F. Smith, Puerto Rico Nuclear Center, P. R.

Dr. and Mrs. George Eiten, Instituto de Botanica, Sao Paulo, Brazil.

Jennie V. A. Dieterle, University of Michigan, Ann Arbor, Mich.

Nancy Corre, University of Guayaquil, Ecuador.

Dr. Del Wiens, University of Utah, Salt Lake City, Utah.

Tashio Segi, Faculty of Fisheries, Pref. University of Mie, Tsu, Japan.

Dr. Paul J. M. Maas, Institute Syst. Planthunde, Utrecht, Holland.

Dr. T. D. Pennington, Forest Herbarium, University of Oxford, England.

James L. Reveal, Utah State University, Logan, Utah.

Dr. Martin Cardenas, University of Cochabamba, Bolivia.

Dr. Hugh H. Iltis, University of Wisconsin, Madison, Wis.

Dr. Michael Kosztarab, Department of Entomology, Virginia Polytechnic Institute, Blacksburg, Va.

Dr. Velva E. Rudd and Dr. William L.

Stern, Department of Botany, U. S. National Museum, Washington, D. C.

David G. Frodin, Division of Botany, Department of Forests, LAE, New Guinea.

David F. Murray, Department of Biology, University of Colorado, Boulder.

Dr. Carl Withner, Brooklyn College, Brooklyn, N. Y.

Dr. Richard Biebl, Plant Pathology Institute, University of Vienna, Austria.

Dr. Gordon L. Squires, Trinity College, Cambridge, England.

Dr. Y. Nashimato and Dr. N. Yamaguchi, Department of Medicine, Kyoto University, Japan.

D. E. T. Moul, Dr. S. S. Greenfield, Dr. James E. Gunckel, Dr. G. Bleecker, Rutgers, The State University, New Brunswick, N. J.

Dr. L. Dunn and R. Dawson, Columbia University, New York.

Dr. Bruce Voeller and Dr. T. Dobzhansky, Rockefeller University, New York.

Dr. Harold Neu, College Physicians and Surgeons, New York.

Dr. Kamel Y. Mickaiel, Ministry of Agriculture, Giza, Egypt.

Dr. Phillip J. Halicki, Scripps Institute of Oceanography, Ja Jolla, Cal.

Dr. W. I. Taylor, Ciba Pharmaceutical Co., Summit, N. J.

Joseph R. Swan, former President of The New York Botanical Garden from 1937 to 1949 and Chairman of the Board of Managers from 1949 until 1958, died at his home in Boca Raton, Florida, on November 9, 1965, at the age of eighty-seven. He headed the committee which raised more than one million dollars for the Garden's fiftieth anniversary.

Mr. Swan was born in Utica, New York, a descendant of early settlers of Connecticut, of which state he was later a resident for many years.

Mr. Swan had a long career in banking and investment – first with the National Commercial Bank of Albany, then with the Union Trust Company of that city. After serving with the American Red Cross in World War I, he joined the Guaranty Trust Company and in 1927 was made its president. Six years later he became a senior partner in Edward B. Smith & Company, continuing as such when the company merged with C. D. Barney & Company, under the name of Smith Barney & Company, until he retired in 1944.

Ira S. Nelson, Professor of Horticulture, University of Southwestern Louisiana at Lafayette, was killed in an auto accident on November 14, 1965. Mr. Nelson contributed several articles on *Amaryllis* to *The Garden Journal*. He collected members of the genus in South America and Mexico on plant expeditions sponsored by the Louisiana Society for Horticultural Research and built up quite a collection of species and hybrids at the University. Mr. Nelson has also done considerable hybridizing of these plants.

At the Nineteenth American Horticultural Congress, held in New York City in October, 1964, Mr. Nelson was awarded a citation for his contribution to the knowledge of ornamental plants valued in the southern United States and for over two decades of teaching students.

Torrey Botanical Club will hold its annual dinner on January 18, 1966, at the Men's Faculty Club of Columbia University, at which Dr. James Gunckel will give his Presidential Address.

Thirty-third Annual Historic Garden Week in Virginia will be held April 23-30, 1966. The current restoration of the Garden Club of Virginia is the Mews, adjacent to St. John's Episcopal Church on Church Hill, the earliest section of Richmond's residential area. The most recent restoration from funds raised by Historic Garden Week is the East Lawn Gardens at the University of Virginia, which were dedicated in May, 1965; the West Lawn Gardens were restored in 1952.

Marigold 'Yellow Nugget'.

The Indoor Light Gardening Society of America, Inc., came into being on September 8, 1965, under a certificate of incorporation from the State of South Carolina. Anyone who is interested in this society, organized to stimulate and promote interest in and educational information on gardening with artificial light, may write to the Membership Chairman, Mrs. Robert G. Washburn, P.O. Box 39, Chippewa Lake, Ohio 44215. Annual dues are $4.00; contributing $6.00; sustaining $12.00; and life $50.00.

Mountain-Ash Hybrids. Years of hybridizing and selection have brought forth new hybrids of the mountain-ash, and the following are being introduced by Wayside Gardens Co., Inc. of Mentor, Ohio: 'Carpet of Gold', which carries clusters of deep golden-yellow berries well above luxuriant dark green foliage on a nicely rounded tree of upright branching habit; 'Red Copper Glow', with berries somewhat smaller than usual, but borne profusely on a high-branching tree—they are of a bright scarlet with overtones of coral and copper; 'White Wax', with large clusters of ivory-white berries on a tree of open branching habit. The three hybrids reach a height of twenty to twenty-five feet.

Marigold 'Yellow Nugget' is among the new varieties of annuals available from W. Atlee Burpee Company of Philadelphia in 1966. It is dwarf—about twelve inches high under average garden conditions—and a triploid, of mixed parentage. One parent is an American marigold, the other, with twice as many chromosomes, is a French marigold; and like hybrids of mixed parentage, 'Yellow Nugget' cannot set seed to become a parent itself. Thus it blooms freely and continually from early summer until frost.

George W. Park Seed Co., Inc. will introduce a number of new varieties this year, all described in their attractive flower

Carnation F_1 hybrid 'Petite Pink'.

book. Among them are carnation F_1 hybrid 'Petite Pink'; it is a nice border plant but will also do well in a greenhouse or under fluorescent light in the home. This is a

Centranthus 'Manaos Beauty'.

miniature carnation with fully double flowers of a warm pink; they measure two inches across and are carried on wiry stems.

Centranthus 'Manaos Beauty' is not new this year, having been offered previously in limited quantity, but seed is now available for wider distribution by George W. Park Seed Co. The flowers, of an attractive medium blue, appear all summer on a plant two feet tall, and the leaves are a deep blue-green. 'Manaos Beauty' thrives in warm summer weather in any kind of soil; it can also be grown in the greenhouse or in the home under fluorescent lights.

BOOK REVIEWS

FLOWERING TREES FOR YEAR-ROUND COLOR IN SOUTHERN CALIFORNIA. Chandler, Philip Edward (text), Ralph D. Cornell (photos) under direction of Dr. Samuel Ayres, Jr. 34 pages, illustrated (color), indexed. California Arboretum Foundation, Arcadia. 1964. Paper $1.00.

For warm climate gardener or tree enthusiast, this book is a delight. All but four of the fifty species illustrated are shown so revealingly as to be identifiable by photograph—the real test of plant illustrations and a test passed by few artists and fewer photographers. It is sad that these four—*Tipuana tipu, Acacia baileyana, Calodendrum capense,* and *Lagerstroemia indica*—blemish an otherwise excellent presentation. All that was needed were insets with floral close-ups. The small drawings of tree outlines were valuable supplements to the photographs. The book should encourage—as it is intended—more use of flowering trees in mild winter parks, boulevards, and gardens.

PHIL CLARK

HOUSE AND GARDEN'S GARDENER'S DAY BOOK. Bailey, Ralph (ed.) 446 pages, indexed. M. Evans and Co., Inc., New York. 1965. $7.50.

This book takes you on a rambling stroll through the entire year with a gardener of wide experience not only in horticulture but in writing. He is Garden Editor for *House and Garden.* The book follows no definite pattern, but is rather a series of essays, one for every day in the year, including one for leap year! The essays are filled with practical suggestions on "how to grow" for the true "dirt" gardener. The style is clear and simple and often poetic; the index comprehensive.

The author lets his fancy roam over almost the entire subject of gardening: flowers, vegetables, shrubs, trees, and landscaping, in different climates and under varying environmental conditions. One little essay speaks of what can be done in a difficult seaside area.

Other essays explain in great detail techniques for planting dwarf fruit trees and shrubs, and in a general way suggest what is good and bad in landscaping.

Each month is headed with a delightful caption, some with dry humor such as the one for August. "The only chores worth doing during the dog days are the ones you can sandwich between catnaps." The one for September reads, "This is the time of the year when beginners start to look forward and veterans begin looking back." Charming drawings accompany these captions.

The book would be appropriate on a bedside table. Open it at random for a few moments of pure delight. You will find poetry, philosophy, a great love of nature, and sound horticultural advice. It will inspire and stimulate any one who loves gardening.

MARION S. GANS
Scarsdale, N. Y.

FUCHSIAS. Wilson, Stanley Z. 293 pages, illustrated (part color), indexed. St. Martin's Press, New York. 1965. $10.00.

Written in typical English style without the use of the first person so frequently overused by American writers of today, this is a comprehensive study on all phases of fuchsia growing. It is, as stated on the jacket, a complete guide for propagation and cultivation. That the listing of varieties, which takes up nearly one-half of the book, is far from complete as admitted by the author, is understandable, considering the vast number of fuchsia cultivars developed since their introduction in the early part of the eighteenth century.

It is evident that the author had American growers in mind as well as growers in Great Britain and on the European continent for sources of supply include American nurseries as well as British.

The fascinating story of how the first fuchsia, *F. coccinea,* was brought to England in 1788, followed by *F. magellanica* and other species with consequent hybridization which has produced our beautiful plants of today, is typical of the plant tales of those early days.

The author has succeeded in making this volume of interest to the beginner as well as the expert by avoiding too technical terms, yet giving information in such a way as to be of equal value to the large-scale grower. However, the intricate detail in which all phases of growing is discussed appears overdone and may be somewhat tiring to the advanced grower.

The use of fuchsias for different purposes is discussed in separate chapters, such as "Fuchsias for Hedges," "Fuchsias for the House and Window Sill," and "Fuchsias for the Greenhouse." Another chapter explains in detail the different shapes in which a fuchsia can be grown—bush, standard, pyramid, pillar, climber, espalier, and hanging basket.

The chapters on propagation and exhibition of fuchsias are most complete, and the one on hybridization leaves no doubt that the author knows his subject. It is explained so clearly that anyone who knows only a little about horticulture could understand it.

The chapter on pests and diseases makes growing of fuchsias appear comparatively easy, since Mr. Wilson claims this genus is relatively free from diseases and the few pests which attack it are simple to control. Even the white fly, to which at one time it was thought that the fuchsia was host, hence its decline in popularity at the beginning of this century, is no longer a problem. As for red spider, the real problem pest of fuchsia growers in the greenhouse, Mr. Wilson writes, "Officially this should never be listed under pests which attack fuchsias; for it only attacks the plant in conditions under which no fuchsia should grow." Would that were possible!

Varieties are listed in twelve groups to correspond with the fuchsias suitable for special purposes discussed in chapters in the first half of the book. This seems a waste of space and for all practical purposes is less useful than it would be if there were fewer groupings.

MARY ELLEN ROSS
Merry Gardens
Camden, Maine

THE ART OF THE CHRYSANTHEMUM. Nakajima, Tameji with collaboration of H. Carl Young. 259 pages, illustrated (part color), indexed. Harper & Row, New York, N. Y. 1965. $9.50.

Designation as an expert in any field is very difficult to earn in Japan, but the term master is beyond the aspirations of all but a very select few. Tameji Nakajima qualifies in this latter category as the result of world-wide recognition of his bonsai chrysanthemum techniques.

Translation of a Japanese master's secrets into English would be difficult, but in this book it is done with a clear and forceful style by H. Carl Young, an American who has spent many years in Japan, during which time he studied chrysanthemum culture under Mr. Nakajima. Now he is considered an expert and instructs Japanese students in the arts of chrysanthemum culture. Together they have produced a book which is authoritative, well-written, and a masterpiece of the printing art.

Infinite patience and attention to minor details are native characteristics among gardeners in Japan. With these ingrained, a Japanese master grower tends to gloss over many items which would be puzzling to American gardeners. Fortunately, Mr.

Young is constantly alert to this danger and is quick to clarify any point which would not be understood in a literal translation from Japanese into English.

Basically, this book is divided into three sections: "general cultural practices," "bonsai," and "large potted styles." The first part contains practical information, which will enable the serious grower to learn the techniques used by Japanese growers to obtain maximum horticultural perfection.

Part two is directed to the experienced gardeners who would like to compress growing techniques and maximum-bloom production in an artistic work of art, by which he can literally bring a beautiful chrysanthemum plant indoors to enjoy in miniature form as one would an exquisite floral arrangement. A chrysanthemum bonsai specimen may be produced in a year, whereas the typical tree bonsai exhibits require many years of patient horticulture to achieve their maximum effect.

For those who think big in their horticultural ambitions part three provides the perfect answer. Here the secrets which Japanese growers have perfected over many years for breath-taking specimen exhibits are clearly defined. One can learn how to grow a cascade of chrysanthemum blooms flowing down ten feet from the plant container; or, provided with infinite patience and a desire to produce a spectacular horticultural display, can find directions for growing the umbrella-shaped form known as the "thousand bloom" style.

Typical of the secrets contained in this book is the following direction for pinching the vegetative growth of a large cascade:

"1. All growth associated with the first ⅓ of the primary branches near the stem is pinched in the period from September 6-8.

"2. Growth from the second or middle ⅓ of the primary branches is pinched in the period from September 9-12.

"3. The remaining branches, including the top of the plant, are pinched in the period from September 13-18."

The Art of the Chrysanthemum will interest all gardeners who love chrysanthemums, all growers who are looking for a new adventure in horticulture, and anyone who appreciates a well-written and excellently illustrated book in the field of specialized horticulture.

CORNELIUS ACKERSON
Keyport, N. J.

SUCCESS WITH HOUSE PLANTS. Smith, Mina. 176 pages, illustrated, indexed. Sports Shelf, New Rochelle, N. Y. 1965. $5.75.

This is an excellent book for the house plant hobbyist, covering a wide range of subject matter in simple, clear language. It explains the wisest method for buying a plant, how to prepare soil for different types, how to care for them. There are explicit directions for watering, fertilizing, propagation, and insect control. The author has drawn excellent pictures of many varieties and shows ingenious ways to use them for decorative purposes. Her illustrations show the use of plants not only in individual pots, but as collections in bottles and dish gardens. She even touches lightly on bonsai.

The appendix lists a great variety of plants suitable for varying conditions in homes. A few of the topics listed in this section are "A Beginner Collection," "Plants For The Average Room," "Plants for Sunless Rooms," and "Large Specimens." This section, too, is well illustrated.

MARION S. GANS
Scarsdale, N. Y.

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THE FUNGI, AN ADVANCED TREATISE: VOL. I. THE FUNGAL CELL. Ainsworth, G. C., and Sussman, A. S. (ed.). 748 pages, illustrated, indexed. Academic Press, New York. 1956. $24.00.

This is the first of a contemplated three-volume survey and review of the biology of fungi. Volume I deals with events at the cellular level. Twenty-nine specialists, including the editors, have contributed to the subject of the fungus cell. The books includes four major subject divisions: (1) Introduction with a brief history of mycology and a review of fungus structure and organization; (2) cell components—the cell wall, flagella, ultrastructure, somatic nuclei and mitosis, nuclear behavior during meiosis, chemistry, carbohydrate metabolism, utilization of nitrogen compounds, and cellular metabolism; (3) nutrition and growth of cells—uptake and translocation, chemical and physical environments, kinetics, mechanism of growth, growth of rhythms, synchrony, and chemostasis; and (4) gene action.

Botanists, mycologists, microbiologists, biochemists, geneticists, pharmacognocists, teachers, and researchers will find the book an indispensable reference.

CLARK T. ROGERSON

ECOLOGY OF SOIL-BORNE PLANT PATHOGENS: PRELUDE TO BIOLOGICAL CONTROL. Baker, Kenneth F. and William C. Snyder (eds.) 571 pages, illustrated, indexed. University of California Press, Berkeley, Cal. 1965. $12.00.

Biological control of plant pests has been a much-discussed subject in recent years. Most of it, however, has involved the control of insects and related pests. The present volume lays the groundwork for biological control of root pathogens including fungi, bacteria, viruses, and nematodes.

Forty-seven of the world's authorities in this field contributed to the first symposium of its kind ever held. It was led by a committee created by the National Academy of Sciences—National Research Council under its Agricultural Board, and was held at the University of California, Berkeley in April 1963.

This excellent volume should be in the library of all soil bacteriologists, mycologists, nematologists, plant anatomists, physiologists, biochemists, and ecologists, but most especially all plant pathologists interested in soil-borne plant parasites.

P. P. PIRONE

THE MOLECULAR BIOLOGY OF DEVELOPMENT. Bonner, James. vi + 155 pages, indexed. Oxford University Press, New York. 1965. $3.50.

James Bonner, Professor of Biology at the California Institute of Technology, has written this book to put into one place the information on the control by nucleic acids of plant development. It is an enthusiastic resumé of our current knowledge in the field and, as such, is useful and timely.

RICHARD KLEIN

CELL BIOLOGY, A CURRENT SUMMARY. Paul, John. 197 pages, illustrated, indexed, bibliography. Stanford University Press, Stanford, California. 1964. $4.75.

That Dr. John Paul is an active experimentalist is evident from two aspects; firstly, his publications in the area of tissue culture and, secondly, his acute survey of modern studies on the cell. *Cell Biology* is admirably compact but factually replete. The biology of the cell, today, is as stimulating to researchers and readers as it was in the days (1665) of Robert Hooke's *Micrographia Illustrata,* and we may laud Dr. Paul for his timely volume.

One, however, may gently chide Dr. Paul for citing Schleiden and Schwann again "in crystallizing the ideas then generally held" (on the cell theory) page 7. Unfortunately, they "crystallized" the wrong theory and deserve to sink into obscurity as far as the cell theory is concerned. Surely it is time we acknowledged the acute observations and contributions to the correct views of the cell theory by Hooke, Wolff, Mirbel, Dutrochet, Lamarck, Turpin, and von Mohl.

This small book covers in more than adequate detail the cytological nature of calls, the molecular basis of cellular structure including the role of macromolecules and biological membranes. The area of cytodifferentiation and cellular transplantation likewise receives careful attention. In a section on the physicochemical basis of cellular activity a discourse on bioenergetics is given with the key roles of the chloroplast and mitochondrion well stated.

Dr. Paul presents a succinct yet detailed account of the organization of cellular activity, including principles of genetic analysis of microbial genetics, enzyme repression and induction. A report of Jacob and Monod's, the 1965 Nobel Laureates, proposal for the regulation of enzyme synthesis bears reading. Cellular interaction via aggregation, contact, and adhesion is described. The book concludes with a section on the origin and evolution of cells.

The twelve glossy plates, including electron micrographs, diagrams, figures of models (as myoglobin) are well-chosen, but it is the text figures, graphs, tables, figures, and diagrams which especially enhance the text. The bibliography of 456 cited references, despite a few errors, is a good selection and especially useful since the titles of the papers are given.

This book can be recommended both for the post-graduate and the informed non-specialist who wish to review the progress in cytology. *Cell Biology* is a "tidy" book, admirable for the clarity of presentation and succinct analyses of current explorations in cell biology—an excellent model of brevity, accuracy, and lucidity in this day of massive and turgid writing.

G M. MATEYKO
Department of Biology
New York University

PHARMACOLOGY OF ORIENTAL PLANTS. Chen, K. K., and Mukerji, B., (eds.) 106 pages, illustrated, indexed. Pergamon Press, Ltd., Oxford, 1965. Distributed by The Macmillan Co., New York. $6.50.

The seventh volume of the Proceedings of the Second International Pharmacological Meeting, sponsored by the Section on Pharmacology of the International Union of Physiological Sciences and held in Prague in 1963. Ten papers, contributed by experts from medical and pharmaceutical research institutions, mainly in Asiatic and eastern European countries, deal with recent investigations on Oriental medicinal plants in the light of modern pharmacological and biochemical knowledge. Among the topics dealt with are: the peptic ulcer-inhibiting activity of licorice root; the results of current research on the medicinal uses of *Schizandra chinensis;* the stimulating effect of *Ginseng* on the adrenal cortex; the anti-cancer alkaloids of *Vinca rosea* (periwinkle); and a review of the complex pharmacological actions of the *Rauvolfia* alkaloids. A useful contribution to a subject about which relatively little of an authoritative nature has been published.

MULFORD MARTIN

THE LIVING PLANT: AN INTRODUCTION TO BOTANY. Brook, Alan J. 529 pages, illustrated, indexed. Aldine Publishing Co., Chicago. 1964. $10.00.

The American edition of a new British textbook on botany. The author, who is Lecturer in Botany at the University of Edinburgh, states in the Foreword that his object is to provide an introduction to botany at first-year university level which will make the student feel from the outset that he is dealing with living organisms. Classical flowering-plant morphology and taxonomy are reduced to a minimum and subjects in which important advances are now being made are given greater emphasis. Rather full treatments are accordingly given of such matters as cell differentiation and the mechanics of growth, the water relations of plants, enzymes, photosynthesis, respiration, heredity, evolution, nucleic acids, and viruses. The final section of the book presents a survey of the plant kingdom from the bacteria to the angiosperms. A stimulating and provocative text, lucidly written and attractively produced. It is well illustrated with the author's numerous and excellent line drawings and photomicrographs.

MULFORD MARTIN

REDOUTE'S FRUITS AND FLOWERS. Redoute, Pierre Joseph. Eva Mannering (ed.) 24 color plates, 11-page preface.

REDOUTE'S ROSES. Redoute, Pierre Joseph. Eva Mannering (ed.) 24 color plates, 9-page preface. Both, D. Van Nostrand Co., Princeton, N. J. 1965. $3.95.

The quality of reproduction is fairly good overall; the color in a few plates is a little muddy, but the rest are quite fresh and crisp. These are two volumes in a series called "Golden Ariels."

CHARLES C. CLARE, JR.

BRIEF NOTES ON RECENT BOOKS

CONSERVATION, NATURAL BEAUTY, ETC.

THE APPALACHIANS. Brooks, Maurice. 346 pages, illustrated (part color), indexed. Houghton Mifflin Company, Boston. 1965. $6.95.

The author, a professor of wildlife management at West Virginia University, knows the Appalachians intimately and their plants and animals, and he writes about them ably and with understanding. And Lois and Louis Darling have drawn exquisite chapter headings.

This delightful book is the first in "a new series designed to interest North Americans in wildlife, plants, and geology of their continent."

A WILDERNESS BILL OF RIGHTS. Douglas, William O. 192 pages, illustrated, indexed. Little, Brown & Company, Boston. 1965. $5.95.

The author, Supreme Court Justice William O. Douglas, is an ardent conservationist, and the majority of his nineteen books deal with the wilderness areas in this and other countries. In his current book he sets forth his views on preserving the "beloved wilderness from mechanized society," and proposes a Wilderness Bill of Rights, embodying a sweeping range of suggestions for a conservation program to be administered by an Office of Conservation, directly responsible to the President and accessible to citizens groups.

NOT MAN APART. Jeffers, Robinson. 159 pages, illustrated (part color). Sierra Club, San Francisco. 1965. $25.00.

Ninety-two superb photographs—twenty eight of them in color—by such famed nature artists as Ansel Adams, Steve Crouch, Philip Hyde, Eliot Porter, Edward Weston, and Cedric Wright—depict the natural beauty of California's Big Sea Coast. The illustrations are accompanied by interpretive lines from Robinson Jeffers' inspirational poems.

Loren Eiseley, in his foreword, writes: "With Jeffers the American wilderness is dangerously close to sundown. One is forced to turn and survey the cities on the site of vanished forests, the vast population explosion with its dire implications . . . Jeffers recognizes that we have treated America's prodigal riches, not with love, but as despoilers."

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Not Man Apart, the tenth volume in the Sierra Club's "Exhibit Format Series," edited by Dana Brower, is published because of the Club's deep concern about what is happening to Big Sea Coast and remaining coastlands elsewhere.

THE WILD CASCADES: FORGOTTEN PARKLAND. 128 pages, references, illustrated (part color). Sierra Club, San Francisco. 1965. $20.00.

Another excellent Sierra Club production, the eleventh volume in its "Exhibit Format Series" under the editorship of Dana Brower, the Club's Executive Director. Harvey Manning, Director and Editor of the North Cascades Conservation Council, and author of books and articles on mountaineering and conservation, has written the text and selected appropriate lines from the works of the American poet Theodore Roethke. The Foreword is by Supreme Court Justice William O. Douglas who states, "The Wilderness of the North Cascades is a national resource of the future, not merely a local commodity, and we need it all, as a nation."

The black and white and the colored photographs by Ansel Adams, Philip Hyde, David Simons, Bob and Ira Spring, Clyde Thomas, John Worth, and others emphasize the beauty of "America's Wilderness Alps, the Wild Cascades."

SOUTH: MAN AND NATURE IN ANTARCTICA. Billing, Graham and Guy Mannering. 207 pages, illustrated (part color). University of Washington Press, Seattle. 1965. $15.00.

". . . at midsummer snow evaporates under the sun's benign glow. Lichens flourish, insects hop among the rocks, penguin chicks grow fat and skua gulls raucous . . ." The authors, New Zealanders, who lived a year in Antarctic isolation as members of the New Zealand Antarctic Research Programme at Scott Base, give a lucid account, a new perspective on the elements, the plants, the animals of this polar region, and of man engaged in scientific pursuits there.

A fascinating book for adults and for the scientific-minded young person.

FLOWER ARRANGEMENT

ABSTRACT AND NOT-SO-ABSTRACT FLOWER ARRANGEMENT. Knight, Mary G. 111 pages, illustrated (part color), indexed. D. Van Nostrand Company, Inc., Princeton, New Jersey. 1965. $5.95.

In this compact, well-illustrated book, Mrs. Wright, an accredited instructor and judge of flower arrangement, discusses the various aspects of this art and the styles which are of particular interest today, contemporary and modern, free form and free style, and abstract. Recognizing the influence of the past on the present, she also devotes a chapter to the traditional.

CREATIVE DECORATIONS WITH DRIED FLOWERS. Thompson, Dorothea Schnibben. 125 pages, illustrated, indexed. Hearthside Press, New York, N. Y. 1965. $6.95.

The author, who introduced the silica-gel method of drying flowers, devotes two chapters to "The New Method of Preserving Plant Material" and "Notes on Flowers and Foliage," and seven chapters to the uses of the dried plant material in many and unusual "creative decorations."

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GEO. W. PARK SEED CO., INC.
Greenwood 129, South Carolina 29647

COLOUR BOOK OF FLOWER ARRANGEMENTS. Clements, Julia. 90 pages, illustrated (color). D. Van Nostrand Company, Inc., Princeton, N. J. 1965. $5.95.

Some of the color reproductions of the arrangements by this internationally known judge of floral art are well done, others are not as true as one could wish. But beginner and more advanced student in flower arranging will find helpful ideas in this book.

FLOWER ARRANGING BY TAT. Tat, Shinno. 100 pages, illustrated. Lane Book Company, Menlo Park, Cal. 1965. Paper $1.95.

Here are basic ideas and step-by-step instructions on creating artistic flower arrangements, in which the tradition of the East is combined with the informality of the West.

FLOWERS

THE JOY OF GERANIUMS. Wilson, Helen Van Pelt. 364 pages, illustrated (part color), indexed. M. Barrows & Co., Inc., New York. 1965. $6.95.

An enlarged and updated revision of *Geraniums-Pelargoniums* for *Windows and Gardens* originally published in 1946, reprinted in 1950 and 1957. Additional text and illustrations have been incorporated.

ANYONE CAN GROW ROSES. Westcott, Cynthia. 220 pages, illustrated, indexed. D. Van Nostrand Company, Princeton, N. J. 1965. $5.95.

In the fourth edition of her popular book, Dr. Westcott adds new observations made in her continuing experience with roses, updates the chapter on "Choosing Roses," in which eighty of the more than three hundred varieties described are new introductions.

TREE FLOWERS OF FOREST, PARK, AND STREET. Rogers, Walter E. 499 pages, illustrated, indexed. Dover Publications, New York. 1965. Paper $3.00.

An unabridged republication of the work first published by the author in 1935, then Professor of Botany in Lawrence College. Dr. Rogers was encouraged in

his efforts to bring out this book, chiefly pictorial, by a number of prominent botanists—among them, Dr. H. A. Gleason, Head Curator Emeritus of The New York Botanical Garden. They recognized its merits in making known tree flowers which "seldom of large size do not attract attention to themselves as do the showier blossoms of the herbs in gardens, conservatories, and woodlands."

FUNGI

THE MOLDS AND MAN. Christensen, Clyde M. 284 pages, illustrated, indexed. University of Minnesota Press, Minneapolis. 1965. $5.50.

To the third edition of *The Molds and Man,* the original of which was published in 1951, a chapter on the toxicity of fungi has been added and the chapter on classification, which was omitted from the second edition, has been included.

Dr. Christensen, mycologist in the University's Department of Plant Pathology, presents factual information in a pleasant-to-read style.

NEUROSPORA BIBLIOGRAPHY AND INDEX. Bachmann, Barbare J. and Walter N. Strickland. 225 pages. Yale University Press, New Haven, Conn. 1965. $4.00.

The "Bibliography" lists 2,310 papers dealing with *Neurospora* from "the earliest known description of the organism and extending through the literature up to January, 1965." The papers are listed alphabetically under the names of the author; for example, those of the late Dr. B. O. Dodge, Plant Pathologist Emeritus of The New York Botanical Garden, are found under D65-D117.

The "Bibliography" is followed by "Author Cross-index," "Subject Index," and "Species Index."

GARDENING

GARDEN BOOK FOR THE SOUTH. Blackwell, Cecil and L. A. Niven. 188 pages, illustrated (part color). The Progressive Farmer Company, Birmingham, Ala. 1965.

This is a splendid guide for southern gardeners, placing before them reliable, practical, month-by-month information and state planting guides, garden pest control charts, etc.

Mr. Niven was horticultural editor of *The Progressive Farmer* from 1919-1959; Mr. Blackwell, who succeeded him, is now Executive Director of American Society for Horticultural Science.

LAWN GUIDE. Stevenson, Tom. 76 pages, illustrated. David McKay Company, Inc., New York. 1965. $1.95.

This compact little book contains good advice for the home owner on fertilizing, watering, and mowing lawns; on lawn grasses and lawn weeds; and on troublesome insects and diseases.

SOIL

INTRODUCTORY SOILS. Berger, Kermit C. 371 pages, illustrated, indexed. The Macmillan Co., New York. 1965. $6.95.

In clear, understandable language, written for those without previous training in chemistry, Dr. Berger, Professor of Soils in the Department of Soil Science, University of Wisconsin, presents the latest information on soils—their physical, chemical, and colloidal properties; soil, water, and air; sound principles of fertilization; soil conservation and erosion control. It is a useful book for one who is interested in learning about practical methods of managing soil to benefit plants.

SOILS IN RELATION TO CROP GROWTH. Bear, Firman E. 297 pages, illustrated, indexed. Reinhold Publishing Corp., New York. 1965. $12.50.

This well-written book is especially for those who want to know the fundamental facts about soil so that they can obtain "high-acre yields of crops of superior quality." Within its covers will be found the origin and classification of soils, their chemical and physical properties, their nutritive needs, testing of soils and fertilizing, soil conservation, and so on. Its author, one of the world's notable authorities in soil science, has written five books, and many papers on soils and soil-plant relationship, and for the past twenty-five years has been the Editor-in-chief of *Soil Science.*

SOIL CONSERVATION IN PERSPECTIVE. Held, R. Burnell and Marion Clawson. 344 pages, tables, maps, index. The John Hopkins Press, Baltimore, Md. 1965. $7.50.

Two members of the staff of Resources for the Future, Inc., a non-profit corporation for research and education in the development, conservation, and use of natural resources, have collaborated in this book, in which the "concern is primarily with the economics, both individual and group, and with the social and political relationships involved in use and misuse of soil." However, the authors "try always to remember that behind these human reactions to soil lie the complex physical structure of the soil itself."

This important book has three parts: I. Background and Setting; II. Performance and Evaluation; III. The Next Generation.

MISCELLANY

AN INTRODUCTION TO PLANT BIOLOGY. Braungart, Dale C. and Ross H. Arnett. 420 pages, illustrated, indexed. The C. V. Mosby Co., St. Louis. 1965. $8.50.

In this second edition of *An Introduction to Plant Biology* (the original was published in 1962) the authors have arranged the text into a more logical presentation, the life cycle section has been completely revised, and new illustrations have been added.

While this book is directed to the beginning student of plant biology, there is sufficient advanced material for those who have completed one of the Biological Science Curriculum Study Programs in high schools.

TOURING THE GARDENS OF EUROPE. McFadden, Dorothy Loa. 306 pages, illustrated, indexed. David McKay Co., New York, N. Y. 1965. $5.95.

Anyone who is contemplating a trip to Europe to visit the famous or the "less-known gardens off the beaten path," will find Mrs. McFadden's book most useful. Not only does she describe the gardens, but she tells the season in which they are at their best and the hours they are open. She also has a "key system," indicating whether a garden specializes in a particular group of plants, such as dahlias, rhododendrons, roses, alpines, and so on.

THE PLANT KINGDOM. Lemon, Paul C. and Norman H. Russell. 215 pages, illustrated. The C. V. Mosby Press, St. Louis, Mo. 1965. $3.90.

In this second edition of "a laboratory manual," which is composed of "exercises on the life histories, structures, and functions of plants," the authors have updated the instructions, eliminated some parts of the exercises and inserted additional genera, and included new exercises on plant physiology and plant ecology.

Part 1 covers Thallophyta, Part 2 Bryophyta.

JAMES SMITHSON AND THE SMITHSONIAN STORY. Carmichael, Leonard and J. C. Long. 316 pages, illustrated, indexed. G. P. Putnam's Sons, New York. 1965. $7.95.

Mr. Carmichael, the seventh Secretary of the Smithsonian Institution, and J. C. Long, historian and author, have successfully collaborated in the first complete biography of James Smithson who, in 1826, wrote an unusual will, bequeathing to the United States a half-million dollars "to found . . . an establishment for the increase and diffusion of knowledges among men."

Their book is not only a lively and interesting biography, but an informative history and guidebook of a famed institution and its vast and varied collections.

HANDBOOK FOR FLOWER SHOWS. National Council of State Garden Clubs, Inc., St. Louis, Mo. 213 pages, 1965. $3.75.

There have been so many changes and improvements in staging a flower show, in flower arrangement classes, in entering horticultural, conservation, and other exhibits, and in judging since the first edition of the Handbook, that the National Council of State Garden Clubs issued this revised edition.

The Handbook should be ordered directly from The National Council of State Garden Clubs, Inc., 4401 Magnolia Avenue, St. Louis, Mo. 63110.

HYBRIDS. Rife, David C. 159 pages, illustrated, indexed. Public Affairs Press, Washington, D. C. 1965. $3.75.

In non-technical language Dr. Rife deals with aspects of hybridization which intrigue laymen as well as scientists. Chapters on "What is a Hybrid?" "The Story of Hybrid Corn," "Unusual Plants," and "Behavioral Genetics" will interest readers of *The Garden Journal.*

DWARF CONIFERS. Brooklyn Botanic Garden. 64 pages, illustrated. $1.00.

The forty-seventh handbook, published by the Brooklyn Botanic Garden, is devoted to three hundred dwarf and low-growing varieties of fifteen major kinds of conifers—arborvitaes, cedars, cypresses, cryptomerias, Douglas-fir, hemlocks, junipers, pines, spruces, yews, and so on. Orders for this helpful handbook should be addressed to the Brooklyn Botanic Garden, 1000 Washington Ave., Brooklyn, N. Y., 11225.

A WITCH'S GUIDE TO GARDENING. Jacob, Dorothy. 118 pages, illustrated, bibliography. Taplinger Publishing Co., Inc., New York. 1965. $3.00.

Floricultural fancy and folklore, garden magic and history fill the pages of this charming book. Herb gardeners will take special delight in *A Witch's Guide to Gardening*, but even those who are not garden owners will find "satisfaction in the largest garden of all, the intangible garden of reading."

MUSEUM DIRECTORY OF THE UNITED STATES AND CANADA. 1,039 pages, indexed. Smithsonian Institution and American Association of Museums, Washington, D. C. 1965. $7.50.

This, the second edition of Museums Directory of the United States and Canada, lists 4,956 museums, over one thousand of which have been established in the past fifteen years. It is a valuable reference.

OUR PLANT RESOURCES. Fitzpatrick, Frederick L. 171 pages, illustrated, indexed. Holt, Rinehart and Winston, Inc., New York. 1964 (rec'd 1965). $2.50.

The author, who is Professor of Natural Sciences at Teachers College, Columbia University, reveals the economic importance of plants from fields, forests, and trees.

GUIDE AND KEY TO ALABAMA TREES. Davis, Donald E. and Norman D. 136 pages, illustrated, glossary. William C. Brown Book Company, Dubuque, Iowa. 1965. Paper $2.25.

The first twenty-seven pages are given over to summer keys to genera and to species, winter keys to genera, and directions on their use. Succint descriptions, many of them accompanied by line drawings of 174 trees native to Alabama follow, and there is also an alphabetical listing of the trees by their common names.

CYTOLOGIC STUDIES ON PHLOEM. Esau, Katherine and Vernon I. Cheadle. 91 pages, illustrated. University of California Press, Berkeley. 1965. Paper $2.50.

This paper amplifies previous reports, since the "use of electron microscopy in research on pholem has revealed details which increased [the authors'] understanding of some of the peculiarities of this tissue, especially those of its most highly specialized cell, the sieve element."

POLLEN STUDIES IN THE CRUSOE LAKE AREA OF PREHISTORIC INDIAN OCCUPATION. Cox, Donald D. and Donald M. Lewis. 29 pages. New York State Museum and Science Service, Bulletin No. 397. (Remittance should be made payable to New York State Education Department, Albany, N. Y.) 1965.

As expressed in the Introduction, these studies were undertaken to reconstruct vegetational and climatic events through late-glacial and post-glacial time to the present and to correlate this information with the archaeology of the region under investigation.

MICROBES IN ACTION, SELECTED EXERCISES FROM. Seeley, Harry W. Jr. and Paul J. Vandemark. 225 pages. W. H. Freeman & Co., San Francisco. 1965. Paper $3.25

This represents a selection of fifty exercises from the unabridged edition of *Microbes in Action* and is designed to provide "an introduction to techniques unique to microbiology and to serve as groundwork for more extensive experience in microscopic, cultural, and physiological methods."

THE GREEN CRUSADE. Hull, Helen S. (ed.) The Garden Club of New Jersey, Scotch Plains, N. J. 96 pages, illustrated. 1965. $1.50.

The history of this organization and its achievements in gardening, civic beauty, and conservation are recounted in an interesting manner by picture and word.

CHARLES DARWIN AND HIS WORLD. Huxley, Julian and H. B. D. Kettlewell. 144 pages, illustrated, indexed. The Viking Press, New York. 1965. $6.50.

Sir Julian Huxley, grandson of Darwin's most ardent supporter, and himself a noted biologist who has explained the theories of evolution on radio and television as well as in his writings, and well-known geneticist Bernard Kettlewell have combined their talents and produced a fascinating life-study of a man and an idea.

The book is generously illustrated—with portraits and contemporary cartoons, and sketches from Darwin's papers.

FOR YOUNGER READERS

PLANTS TODAY AND TOMORROW. Hyde, Margaret O. 157 pages, illustrated, indexed. McGraw Hill Book Company, Inc., New York. 1965. $3.00.

This is the second printing of the book originally published in 1960. Miss Hyde, who was head of the Science Department of the Shipley School, and a Science Consultant at the Lincoln School of Teachers College, Columbia University, knows how to make the basic facts of plants and their importance to life fascinating to young people.

Dr. George L. McNew of Boyce Thompson Institute for Plant Research and Dr. Annette Hervey of The New York Botanical Garden are among the people whom the author consulted.

EXPLORING THE FOREST, EXPLORING THE RIVER, EXPLORING THE SEACOAST. Perry, John and Jane Greverus. Approximately 200 pages each, illustrated, indexed. McGraw-Hill Book Company, Inc., New York. 1965. $3.50 each.

Mr. and Mrs. Perry, ardent conservationists by vocation and avocation, go camping and hiking with their children over weekends and during vacation periods. And their three books are an exciting introduction, for junior high school students, to the principles of conservation and to the plants and animals of forest, river, and seacoast.

Arnoldia, Vol. 25, No. 8, of the Arnold Arboretum, Jamaica Plains, Massachusetts, carries on article "Plants for Screening Junkyards, Gravel Pits, and Dumps." Dr. Donald Wyman, the Arboretum's Horticulturist, suggests that in keeping with the Federal government's concern with the beautification of this country and the control of outdoor advertising and junkyards along the highway, "it would not be amiss to take a hard look at some of our town dumps and state-owned gravel pits, with the idea of planting trees and shrubs to screen them from public view.

"The sites of these depositories have undoubtedly been selected because the land is poor or unwanted. Also, it is impractical to expect that, if a highly ornamental planting were made in such places, it would be maintained . . .

"However, there might be some interested enough to make an initial planting of rugged, fast-growing trees and shrubs—plants, which once established, will take care of themselves without much additional attention . . ."

Dr. Wyman's article furnishes lists of "low maintenance" trees and shrubs.

Any garden club or other group interested in screening such a place in its community from public view may obtain a copy of this issue of *Arnoldia*, as long as the supply lasts, from the Arnold Arboretum.

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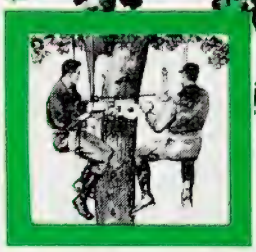

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THE NEW YORK BOTANICAL GARDEN

Volume 16. No. 2 March - April, 1966

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THE GARDEN JOURNAL

DOROTHY EBEL HANSELL, *Editor*

This number of *The Garden Journal* is dedicated to Mrs. Harold I. Pratt, member of the Board of Managers, a friend of long standing and a generous supporter of The New York Botanical Garden, in whose honor the new facility at the Garden has been named the Harriet Barnes Pratt Library Wing.

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You can enjoy a free subscription to The Garden Journal *by becoming a member of The New York Botanical Garden. Write to the Membership Secretary, The New York Botanical Garden, Bronx, New York 10458, for information on the different classes and privileges of membership.*

CREDIT FOR ILLUSTRATIONS

Front-cover illustration—the lobby of the Museum and Administration Building of The New York Botanical Garden, with the entrance to the Harriet Barnes Pratt Library Wing at the rear, pp. 43-45, 65, 66, lower right 73, lower left 74, 75, Walter Singer; pp. 56-59, John Mark Patek; pp. 61-63, J. B. Collins—courtesy Riding Reflection; p. 68, Hal Campbell Photos; p. 69, The New York Botanical Garden; top p. 73, Natalie Davis; lower right 74, John Speck, *The New Milford Times.*

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THE HARRIET BARNES PRATT LIBRARY WING DEDICATED DECEMBER 16, 1965

CHARLES B. HARDING, President of The New York Botanical Garden, "appropriately, formally, and officially" dedicated the new facility as the Harriet Barnes Pratt Library Wing on December 16, 1965. The dedication was witnessed by more than three hundred members of the Garden and invited guests in the Auditorium of the Museum and Administrative Building.

Mr. Harding, in his opening remarks, said:

It is my particular pleasure to say a few words about Mrs. Pratt for whom the new library wing we are dedicating today is to be named. She has been our inspiration, guide, and support for many years. I have asked our historian, Henry de la Montagne, to outline for me her connections and beneficences. It would take too long to list them all, but here are a few.

There is no record of the date when Mrs. Pratt first became a member, but she exhibited in a flower show at the Museum Building during May, 1915.

She served as a member of the Advisory Council, predecessor of the Advisory Volunteers, from 1919 until 1954 when she was elected an honorary member of that wonderful group of women.

In 1931, she was elected a member of the Corporation of The New York Botanical Garden.

Since January, 1939, Mrs. Pratt has been a member of The Board of Managers of The New York Botanical Garden, and since 1948 she has been a member of its Executive Committee.

She was appointed Vice-Chairman of the City Relations Committee in 1942, succeeding Henry de Forest Baldwin in that post; in 1948, after the death of Mr. Baldwin, she became Chairman of the Committee. During many of the years she held that position Robert Moses was Parks Commissioner. She succeeded in taming that lion!

In 1942, through Mrs. Pratt's generosity a base plan of the Garden was prepared by Major Gilmore Clarke. And in 1949, she underwrote the cost of the "Floral Flyer."

During the years 1944 and 1950, Mrs. Pratt served as cochairman of a committee which raised upwards of a million and a half dollars towards the Garden's postwar development program.

In December, 1958, knowing that the Garden was having difficulty in retaining its scientific people because of inadequate salaries, Mrs. Pratt donated a substantial sum to meet this emergency.

In 1953 and 1954, largely through Mrs. Pratt's untiring efforts and determination, the renovation of the Snuff Mill was completed. She was by far the largest contributor.

Similarly, during the period 1954-1956, she aided very materially in financing and bringing to fruition a plan for the construction of the research laboratory building.

In 1960, when the Garden started planning for a new library wing, Mrs. Pratt's generosity and encouragement accounted in no small measure for success in this great accomplishment.

The New York Botanical Garden twice presented its Distinguished Service Award to Mrs. Pratt, in 1951 and again in 1964. Her support, encouragement, and gentle needling have inspired all of us connected with the Garden to exert our maximum efforts in its behalf. She has been a great leader in a great work. But more than this she will ever remain dear to the hearts of all of us for the many kind and thoughtful things she has said and done.

And now I should like to say a few words of thanks to Angela Moore Place, for whom we are naming the reading room in the new library wing.

Mrs. Place has served as Chairman of the Library Wing Committee since the inception of the plan to make that addition to the Museum Building. Her Committee was charged by the Board of Managers with selecting the architects, raising the funds, and supervising the construction, and it should be proud, indeed, of its accomplishment.

Over $1,100,000 were raised for this purpose. Of this amount $500,000 were contributed by the City of New York, and for this we are most grateful to Commissioner of Parks Newbold Morris. He had the breadth of vision to see the value, to the City, of the scientific activities conducted by its cultural institutions. $300,000 were contributed by the National Science Foundation, a strong endorsement of the importance of the work we are doing here. The balance was raised from among the Board of Managers and the members and friends of the Garden. Mrs. Place, with her sweet but determined nature, was largely responsible for this.

She spent many hours with Dr. Steere, his staff, and the architects, making sure that we should have the most up-to-date and efficient library that could be produced. When construction started, she became practically a clerk of the works, visiting the operation at least weekly. In fact, the new Library Wing is so much her creation that Angela Moore Place should be enshrined in the cornerstone!

Elizabeth C. Hall, Associate Curator of Education, at the request of Mrs. Pratt read the following letter:

November 26, 1965

Dear Mrs. Pratt:

Mrs. Hermann G. Place has told me that you would like to have me send to you a few brief notes about the Library which you might wish to use at the dedication.

The Library's steady growth throughout the twenty-eight years that I have been close to it has been characterized by many notable additions of personal libraries of outstanding people in the botanical and horticultural

fields. As a result, the Library is especially rich in what we librarians call "association" copies. Therefore, it is not one library but many.

In it are preserved the actual volumes that were cherished by Sarah Gildersleeve Fife, Eleanor C. Marquand, Sara Virginia Coombs, Clarence McKay Lewis, Colonel J. E. Spingarn, Mrs. Clement S. Houghton, Mrs. Elon Huntington Hooker, Helen Morgenthau Fox, Mrs. Rodney Procter, Mrs. Ernest G. Vietor, Mable Choate, Mrs. Gilbert A. Montague, Colonel Robert H. Montgomery, Dr. H. A. Gleason, Dr. A. B. Stout, H. R. Kunhardt, Dr. B. O. Dodge, Robert Hagelstein, Dr. R. A. Harper, Dr. Elmer D. Merrill—to name only a few.

But fine collections of books, valuable as they are as records of the past and treasures to be preserved, do not serve the best interests unless they are made easily available to those in need of assistance. The last three decades at The New York Botanical Garden have seen a tremendous increase in the use of the resources of the Library by students of botany, horticulture, and landscape design, by amateur and professional botanists and gardeners, by teachers, conservationists, and research workers in industry.

There is no doubt that the Library of The New York Botanical Garden is one of the most valuable possessions of this great institution. Were it lost, it could never be replaced.

Very sincerely yours,
ELIZABETH C. HALL

REMARKS

By ANGELA M. PLACE, *Vice President*
The New York Botanical Garden

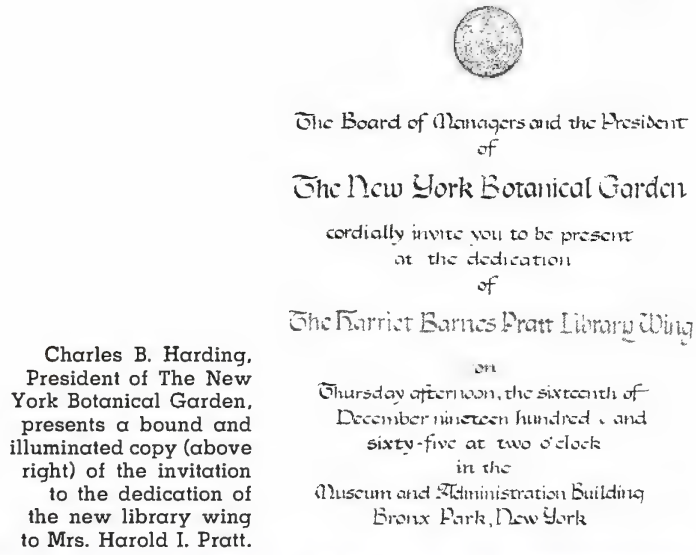
It seems almost impossible to me that we are here today on December 16th to dedicate the new library wing of The New York Botanical Garden. At moments I have felt that two centuries might pass, like building a mediaeval cathedral, before this wing would be completed. I am happy to say this has not been true.

This project was started about four years ago and met with the usual ups and downs of interviewing architects, studying plans, and getting the funds in hand and construction under way. Today, the Library stands completed, with perhaps a slight lack of furniture which will, in due time, make its appearance. None of this miracle would have been possible without the great generosity of Mrs. Harold Irving Pratt for whom this library is named. Her knowledge of the needs of the Garden and her initiative in planning for this great library have been an inspiration to all of us who have worked towards this building in which you will stand today. For many years she has loved The New York Botanical Garden, and every one of us think of her with love and deep admiration.

As Chairman of the Library Wing Committee, I want to say that it has been for me a most happy experience because of all the wonderful people I have worked with. I want to express my appreciation to Dr. Steere who through every set-back has been a tower of strength and just like a tonic to one's sinking spirits. I also want to thank the Mayor of New York and the Park Department for their interest and support of the cultural betterment of our great City. The architects have been wonderful throughout, and I want to express a special thanks to Herbert Hopp, who has listened to my plaintive cries for the last six months with kindness and always with results.

I also want to thank the many donors, both individuals and foundations, who have made this new library wing possible. Very special thanks go to Eleanor Merrill who, as a member of The New York Botanical Garden and of the Advisory Volunteers, undertook to create the Rare Book Room which, I think you will agree, is a very beautiful room. She has given unending time and the gift of her great knowledge in this field, and I am deeply grateful.

It is a joy to all of us to see so many here today and I want to thank everyone for our new library wing.



The Board of Managers and the President
of
The New York Botanical Garden
cordially invite you to be present
at the dedication
of
The Harriet Barnes Pratt Library Wing
on
Thursday afternoon, the sixteenth of
December nineteen hundred and
sixty-five at two o'clock
in the
Museum and Administration Building
Bronx Park, New York

Charles B. Harding, President of The New York Botanical Garden, presents a bound and illuminated copy (above right) of the invitation to the dedication of the new library wing to Mrs. Harold I. Pratt.

Acknowledgement

By H. Irving Pratt

My mother, Harriet Barnes Pratt, has asked me to thank the President and the Trustees of The New York Botanical Garden for associating her name with the new Library Wing.

The action of the Board of Trustees establishes a continuing honor deeply appreciated by my mother, her daughters Eleanor and Barbara, and me, together with our respective spouses, James Hunt, Davis Wilmerding, and Ellen Pratt.

My mother has also asked me to congratulate my good friend Charles B. Harding on outstanding leadership given the Botanical Garden during his presidency and to recognize Dr. William C. Steere for his achievements as an administrator, for his research, and the scientific work he has organized. The substantial grant made by the National Science Foundation toward the cost of the new library wing is taken by me to be an indication of the stature of Dr. Steere's accomplishments and the promising future for this institution.

The Botanical Garden has played a significant part in my mother's life and has provided a constructive outlet for her energy. It has been very close to her heart. In keeping with all undertakings which are worthwhile and add to the knowledge as well as to the pleasure of others, there is a rewarding by-product in the form of lasting and meaningful friendships. I wish I felt I had time to dwell longer on what these friendships have meant to my mother.

I see many of my mother's friends here today. To these thoughtful people, as well as to those who had an official part in the naming of the library wing, in behalf of my mother and her children, I say again, "Thank you very much."

Remarks

By Dr. William C. Steere, *Director*

The Library of The New York Botanical Garden is internationally famous as having the largest collection of botanical and horticultural books in the Western Hemisphere. Its shelves contain seventy-five thousand volumes and almost five hundred thousand unbound papers, periodicals, and reprints. Our Library is especially rich in publications of the eighteenth and nineteenth centuries, and also contains a number of volumes from the sixteenth and seventeenth centuries.

In 1891, Columbia University deposited here, on loan, its entire collection of some five thousand bound volumes on botany; it is still mostly in our Library.

Another early acquisition of over two hundred volumes came from the library of Dr. David Hosack, Professor of Botany at Columbia from 1795-1811, when he became Professor of Materia Medica and Clinical Medicine at the College of Physicians and Surgeons. It was Dr. Hosack, incidentally, who established the Elgin Botanical Garden, the first institution of its kind in the State. This early botanic garden was located opposite the Cathedral at Fifth Avenue and Fiftieth Street, now the site of Rockefeller Center.

The New York Academy of Science, which was founded in 1817, donated its botanical library of several hundred rare and valuable works.

While the Library has been the beneficiary of many hundred volumes over the years, it has also acquired hundreds more by direct purchase. In 1923, for instance, the consolidation of several botanical libraries in Geneva made it possible for the Garden to buy all the resulting duplicates, comprising more than five thousand bound volumes and many thousand unbound pamphlets.

Our Library is a research tool of national and international importance, as well as an information center for many hundreds of visitors each year. Countless botanists from all parts of the United States and the world come to the Garden to use the Library's facilities.

Some years ago our Library outgrew its original quarters and has since sprawled out over other rooms which were not designed for such usage, causing some deterioration to the collections and some detriment to other Garden activities.

The need for more space became so acute that the Board of Managers decided in 1959 to add a new wing to the present Museum and Administration Building. Mrs. Place was asked to serve as Chairman of the Library Wing Committee to raise the necessary funds estimated at $1,000,000, of which the City, after protracted negotiations, agreed to assume one half. The design of the building is the work of the prominent architectural firm of Eggers and Higgins. The building is air-conditioned, five stories high, and besides provid-

Seated, left to right, Mrs. John M. Senior, Mrs. H. Irving Pratt, Mrs. James R. Hunt, Mrs. David R. Wilmerding, and Mrs. Harold I. Pratt at the dedication of the library wing. Standing, John F. Reed, Curator of the Library.

ing adequate library space, accommodates administrative offices and modern classrooms. Fund-raising started in 1960, actual building construction on May 28, 1964, and today, December 16, 1965, construction is essentially complete.

The cost of the new wing with furnishings is expected to total about $1,100,000. Shelf space of twenty thousand feet will provide sufficient space for expansion, at our present rate of growth, for an estimated fifty years.

This new addition to the Museum and Administration Building is to be known as the Harriet Barnes Pratt Library Wing; the Reading Room is to be named in honor of Mrs. Place. And I should like to suggest that on your inspection of the new library facilities you also note the Rare Book Room with its beautiful antique furnishings, inlaid teakwood floor imported from Rhodesia, and custom-built oak shelves. This gift from one of our benefactors is in memory of Edwin Cornell Jameson.

Dr. Steere then introduced Foster E. Mohrhardt, Director of the National Agricultural Library, who gave the principal address. Dr. Steere and Mr. Mohrhardt are friends of long standing, both were born in the same year in the State of Michigan, and have served together on many committees. Dr. Steere briefly referred to the many offices Mr. Mohrhardt has held in national and international organizations and the many honors conferred upon him. (Mr. Mohrhardt's address appears on page 46 of this number of *The Garden Journal.*)

Remarks

By T. H. Everett, *Assistant Director (Horticulture)* and *Senior Curator of Education*

We are here to dedicate the Harriet Barnes Pratt Library Wing at The New York Botanical Garden, and, most appropriately, previous speakers have stressed Mrs. Pratt's absorbing interest in this great facility and in the magnificent collection of books it will house. The Library is truly one of my own real joys, and I hope that I detract not from the importance of this occasion by referring to another of Mrs. Pratt's interests and achievements.

I am impelled to pay special tribute to Harriet Barnes Pratt as a patroness of gardening and as a great horticulturist in her own right. Many here will remember the splendid exhibits she staged in prewar years at New York International Flower Shows, at fall exhibitions of The Horticultural Society of New York and at monthly meetings of that Society, as well as those notable flower shows featured at the Pratt Oval.

Those privileged to visit her estate, Welwyn, will recall with rare pleasure the magnificent gardens she created there—the azaleas—the irises—and the primulas—all thriving amazingly and arranged with rare knowledge and exquisite taste. Nor must we forget the charming salvia named 'Welwyn' that Mrs. Pratt raised and generously distributed to other gardeners. Welwyn was a garden paradise. It represented a standard of horticultural achievement which I fear we may not see again.

Mrs. Harold I. Pratt in the Edwin Cornell Jameson Rare Book Room. Open on the table are *The Natural History of Carolina,* Volume 1 (1754) by M. Catesby and *Phytographia curiosa* (1711) by Abraham Munting.

In honoring Mrs. Pratt for her horticultural accomplishments, I must admit that she did not work quite alone—there was always Ferguson, a dour and knowledgeable Scot who labored sympathetically to carry out Mrs. Pratt's ideas and objectives. It was a good partnership. Not that Mrs. Pratt and Ferguson always saw eye to eye—they didn't—for who could be expected to always agree with a Scottish gardener of the "Old School"? But undoubtedly Mrs. Pratt gained some of her knowledge of gardening from Ferguson, and most surely Ferguson learned a great deal from Mrs. Pratt. The gardens at Welwyn and the flower exhibits that originated there, and that brought pleasure and delight to so many thousands, bore tribute to the effectiveness of this happy employer-employee relationship.

I ask you to honor Harriet Barnes Pratt for her outstanding horticultural achievements by according her a rising ovation.

Books are the legacies that a great genius leaves to mankind, which are delivered down from generation to generation, as presents to the posterity of those who are yet unborn.

Joseph Addison

All that mankind has done, thought, gained, or been; it is lying as in magic preservation in the pages of books . . . The true University of these days is a Collection of books.

Thomas Carlyle

THE EMERGENT LIBRARY HYBRID OR SPORT?

By FOSTER E. MOHRHARDT

Mr. Mohrhardt is Director of the National Agricultural Library

INTRODUCTORY STATEMENT

Too often we fail to recognize that our institutions are so important that they serve as national and international landmarks, museums or cultural centers. Here at The New York Botanical Garden I should be remiss not to acknowledge that the Garden and its library are highly significant national resources. The broad scope of the library's holdings, its invaluable rarities, its dedication to service, and its general availability to botanists throughout the country establish it truly as in essence a great national library.

Its very existence has enabled us in the National Agricultural Library and those in other libraries to direct our attention toward specialized aspects of botany and horticulture, knowing always that this tremendous collection can be used at any time by our scientists. The coupling of high utility and unusual beauty places the Harriet Barnes Pratt Library Wing in a category with the Folger in Washington, the Clements in Ann Arbor, and the Huntington in California. Many who have contributed to the development of this internationally unique collection have been saluted today, and I should like to pay tribute particularly to the Director of this great institution, Dr. William C. Steere, whose imagination and vision have contributed so much to botanical developments throughout the world.

DURING THE PAST FEW YEARS we have become accustomed to encountering pickets at any important place or event. Many of you today are unaware of the pickets who present themselves at the dedication of modern library buildings. Those of us with sensitized antennae are very much aware of these invisible pickets who always carry the same signs, "Libraries Are Dead, Long Live Computers!" Although we associate pickets with long hair and straggly beards, these library pickets are quite different—well-shaven, hair cut, and of sleek, business-like appearances. The more militant of the pickets sincerely believe that libraries *are* dead and that computers can replace them and solve all communication problems.

Although the extremists in the automation group are as absurd as extremists of any type, they should not divert us, through reaction, from recognizing significant new developments which may reshape special and research libraries in the next quarter century. For the next few minutes let us ignore the visionaries and long-range dreamers. Let us look closely at actual working experiments and practical designs which will change many library activities in the next few decades.

Since 1961 the Massachusetts Institute of Technology has been operating an experiment called "MAC," a dual purpose acronym for "machine-aided cognition" and for "multiple access computer." In a highly oversimplified comparison we may say that the computer in this system replaces the stacks, reference and circulation units of a library. Information which we are accustomed to finding in printed format is shelved or stored in the computer. The user who wishes to locate and obtain information poses his question through a typewriter device which is electronically connected to the computer. Hence instead of going to a circulation or reference librarian, the user types his question on the typewriter. The computer searches, locates, and provides the answer directly to the inquirer. The reply may be in different forms—a typed statement, a photographic copy, or a picture on a television tube.

As an example of actual use, Prof. Merril Flood through his teletypewriter in Ann Arbor, Michigan, can make direct contact with the computer in Cambridge, Massachusetts, and regularly and effectively use "MAC" in his research work. He calls on the information in the computer and also sets up his own reference and bibliographic files for future use. A special program in the "MAC" system aids the user in editing and formating his papers for reproduction.

In the more sophisticated phases of this experiment, the computer can furnish the user with a visual display similar to that on a television screen. He might request a pictorial display such as a bridge design. Through the use of a device similar to a small flashlight, the user can put a theoretical load on the bridge and the picture will indicate whether or not the bridge can support such a load.

Naturally an experimental system such as this has many deficiencies. It is greatly limited in the amount of information it can store. It is expensive compared to conventional library techniques. The number of users who can call upon its services simultaneously is small. Its outlets are now greatly limited as contrasted with books which can be carried about at one's convenience. It is also subject to mechanical and electrical problems.

What has been described is the first step. Now MIT under the direction of Dr. Carl Overhage with the guidance of librarians, engineers, physicists, and others is designing a new experiment, a computerized library to become operational between 1970 and 1975.

The project called "INTREX" is the most practical and intelligent of the proposals yet made for library automation. In essence, the basis would be a computer or computers storing all types of library information. This would be available to students, scholars, and others through an electronic network covering every part of the country. A scholar here at the Botanical Garden might interrogate the system through a "Touch-Tone" telephone, such as is commonly available today. He would make inquiries concerning books, documents, and data and would have the information supplied instantly as a photocopy, micro-film, magnetic tape, or film projection.

In addition to using the information in the computerized library, the research worker will also be able to build up his own personal bibliographic files in the computer. They will be available only to him and accessible for instant recall. He can discontinue his time-consuming filing and interfiling of references, throw out his reprint collection, and use the time formerly spent on these activities for productive research work.

This oversimplified summary roughly sketches a possible picture of a special library of 1975.

Automation enthusiasts have already notified editors, publishers, and librarians that they represent outmoded communication activities. The specialists in engineering, computers, artificial intelligence, and systems design know too little about the research process, the total information system, and libraries themselves to attempt an obliteration of our present library system and an immediate rush into new procedures.

We have thus far in this century so misused basic resources and new developments that we face continuously national and international crises. We oversaturated the landscape with pesticides, ignored the need for planning of water resources, and successfully polluted our entire environment. Now we recognize that imbalances and abuses have been perpetrated which could have been prevented by care in planning and evaluation.

We could not afford the risks we took in pesticides, water and pollution abuses. We may face an even greater danger in summarily writing off publishers, journal editors, and librarians. We might find that an accelerated, headlong rush into information automation could impair a system of intellectual development and growth which has worked effectively for centuries.

Derek Price points out that: "The body of science seems to have a structure which makes it peculiarly appropriate for little units of contribution to be laid down by one worker after another so that each man can build on the knowledge just built up by previous workers.

"As each man adds his particular brick of learning so the building of the mound of science grows, sometimes in one place, sometimes in another. What seems special to science is that the bricks that are there on the top of the pile seem to provoke or generate fresh bricks to be added to them."

Machine enthusiasts too often have little appreciation of the subtle and yet strong reactions in this long-established system. We must be certain that these new techniques which provide such speed and versatility do not at the same time counter the scientist's creativity, spontaneity, and his close working relationship to what has preceded him. The bricks of learning have been shaped and placed in patterns which have led to our high level of scientific development. Let's be sure that neither the base nor the superstructure is weakened. This in no way implies an opposition to automation—but rather a use of computers as *tools,* not ends.

The physical abilities of the scientist have been greatly expanded through mechanical aids such as power drills, electronic microscopes, and accelerators or cyclotrons. Now the door has been opened to devices which will aid and support his intellectual efforts. This is the context in which we must explore these new systems—not as enemies of books and libraries but as exciting new aids in expanding the usefulness of books.

A fellow botanist, John Stevenson, has pointed out to us the serious problems facing mycologists in their collection, sorting, identification, and location of information. There are millions of records today concerning plants about which the scientists need information on nomenclature, taxonomy, morphology, physiology, distribution, ecology, life cycles, and so on. Although many of these records have been printed in journals, and although many of the journals and the articles have been indexed in bibliographies, in review articles, and in abstract journals, it is still a monumental task for the mycologist in his highly specialized area to find the information he needs. There are more than a quarter of a million species of phanerogamic plants now known and another one hundred thousand to be described. Many of these have been named more than once, and some of them many times. An indication of the disorganization in plant names was pointedly shown in a study of fungi. In a listing of 9,250 generic names, only half were found to be valid and the other half were synonyms.

The New York Botanical Garden has been a leader among scientific groups in recognizing the possible usefulness of electronic data-processing equipment for organizing and managing this amorphous and multitudinous mass of highly valuable information which had been recorded in the past two thousand years. The experimental work with the International Plant Index has provided useful information concerning the abilities and also the deficiencies of machines in organizing taxonomic information.

During the entire history of science, communication has presented a constant problem to scholars. At least three hundred years ago, complaints were made that there was too much for any one individual to read. Abstracts were then developed to assist the scientist in coping with the outprint of print. After the development of abstracts, there was concern on the part of many that these summaries would in part replace the journals themselves. In our own century scientists have been much concerned with the tendency toward overspecialization and the subsequent loss of broad basic knowledge. Now in recent years a counterpart problem arises in the concern of many about the highly interdisciplinary or multidisciplinary needs of scientists. In fact, today we have an accumulation of all these problems—too much print, too voluminous abstract journals, overspecialization, and interdisciplinary needs.

But our situation is in no way hopeless. We have reviewed some of the practical activities already carried on by electronic equipment, and we have anticipated some of the developments which will refine their services even further. One would be derelict, however, to leave this subject with any implication that this equipment will supersede all present communication activities including library structures. Only a few of the boldest of the machine protagonists claim this. Those with ex-

perience both in library and computer work agree that these new developments are useful to us in the same way that telephones, typewriters, dictating equipment, and photographic devices have enabled us to speed up and expand our library services.

One can predict with conservative certainty that within the next two decades we shall find electronic data-processing and computer equipment aiding the library and its users through:

1. Speedier listing and cataloging of library materials.
2. Speedier and complete access to the entire library collection.
3. Network arrangements which will make readily available the total country's resources to the scientist or research worker no matter where located.
4. Aid to the scientist in building up his own private files of botanical information, thus relieving him of a burdensome and time-consuming operation.
5. Rapid assembly and storing of much valuable scientific data and information which is now available only in private files or in manuscript.
6. Opportunities for wider cooperative efforts between scientists in performing comparable work in widely separated geographic areas.
7. Vast improvements in collecting, sorting, analyzing, and identifying taxonomic data.

These are safe predictions of new aids to the librarian and the scientist. They leave intact the importance of books as prime conveyors of man's knowledge.

This magnificent library that we are dedicating today will continue to serve, even under the most advanced systems, as a dynamic aid to all those interested in the broad field of botany, as well as serving the nation and the world as a major repository of botanical information, data, and artistic recording of nature.

We at the National Agricultural Library, with our new library building ready for construction within the next few months, as well as the many other librarians planning university and special libraries throughout the country, are firmly convinced that major libraries such as yours and ours will continue for years to come to serve as homes and workshops for printed books and those who need them. Reaction to the printed book, stimulation from colored illustrations which have all the beauty of the finest paintings, and the unique environment of the library provide a stimulus to the reader which has been completely ignored by those who would sacrifice all to the satisfaction of automation.

The Harriet Barnes Pratt Library, including the Edwin Cornell Jameson Rare Book Room and the Angela Moore Place Reading Room, provides an environment of beauty and inspiration which is unique and awe-inspiring. Who could leave here without an assurance that libraries are indeed alive, energetic, and filled with the heritage of wisdom, reposing in an edifice of architectural beauty, and in an environment of the grandeur which only nature can provide.

RUSSIA'S FOREMOST BOTANICAL GARDEN

By ARTHUR CRONQUIST

Dr. Cronquist is Senior Curator of The New York Botanical Garden. His study was supported in part by a grant from the Bache Fund of the National Academy of Sciences, and in part by a grant from the National Science Foundation.

All photographs dated 1965 were taken by Dr. Cronquist; all others were received from Armen Takhtajan.

DURING THE SUMMER OF 1965 I spent nearly a month in Leningrad, primarily for consultation with Dr. Armen Takhtajan, Chief of the Department of Higher Plants of the V. L. Komarov Botanical Institute. Both of us have devoted considerable attention to the general system of classification of plants, and there are enough similarities and enough differences in our ideas to warrant extended discussion. Our area of agreement was significantly expanded during the month, and I feel that my trip was highly successful.

I was very cordially received at the Institute, and I know that other American visitors would also be welcome. Like most American tourists, I arrived in Russia speaking no Russian, but enough people at the Institute speak English, or German, or French, so that communication was not too difficult. Takhtajan speaks excellent English.

My time was so thoroughly occupied by my primary professional business, and by the business of living in an unfamiliar environment, that I did not get as closely acquainted with some of the staff as I might have wished. Even had I been able to pay more attention to getting to know the staff, it would have been the wrong time of year, because many of them were in the field or on vacation. My comments therefore do not reflect a real understanding in depth; nonetheless, American botanical visitors to Russia have been so few that it might be worthwhile to pass on a few facts and impressions. Those who want a more formal history will find it in a booklet published by the Academy of Sciences of the U.S.S.R., called *An Outline of History of the V L. Komarov Botanical Institute* (1714-1961).

The Botanical Garden at Leningrad, now called the V. L. Komarov Botanical Institute, is one of the world's oldest and most important botanical institutions. The exact date at which it may be said to have been founded is as debatable as that of The New York Botanical Garden, but its 250th anniversary was officially celebrated

in 1965. At about seventy years, The New York Botanical Garden is less than one-third as old. All branches of botany, including anatomy, biochemistry, cytology, and physiology, are embraced within the institute, but the emphasis is on taxonomy and plant geography, where it has always been in the past.

V. L. Komarov (1869-1945) was one of the most productive and prestigious botanists in Russian history. In America he is best known as the editor and partial author of the Flora of the U.S.S.R. (thirty volumes, 1934-1960), but this is misleading, because much of it was done after his death. In 1934, the year the first volume of the Flora was published, he was called to Moscow for higher administrative responsibilities. Organizational and editorial responsibility for the Flora then passed to E. G. Bobrov, who is still an active staff member of the Institute. In 1940, when the Institute was named for him, Komarov was President of the Academy of Sciences of the U.S.S.R. Komarov was especially interested in the flora and plant geography of eastern Asia, and he wrote a Flora of Manchuria and a Flora of Kamtchatka. For many years he planned to do a Flora of Mongolia and China, but this ambition was superseded by the ultimately successful effort on the monumental Flora of the U.S.S.R.

The herbarium of the Institute is one of the world's largest, with an estimated five million plus specimens. Only Kew, with an estimated six and a half million specimens, is clearly larger. No other Russian herbarium approaches it in size or importance. The New York Botanical Garden, for comparison, has perhaps three million specimens. None of these figures is exact, because the specimens are not serially stamped. The vascular plant herbarium is divided into several large regional herbaria, each with its own curator and occupying its own floor or wing. This arrangement is convenient for those working primarily within a given region, but awkward for those concerned with a worldwide taxonomic group. In addition to the curatorial staff, whose duties include both curating and taxonomic research, there is a separate staff of taxonomists who have no curatorial responsibilities.

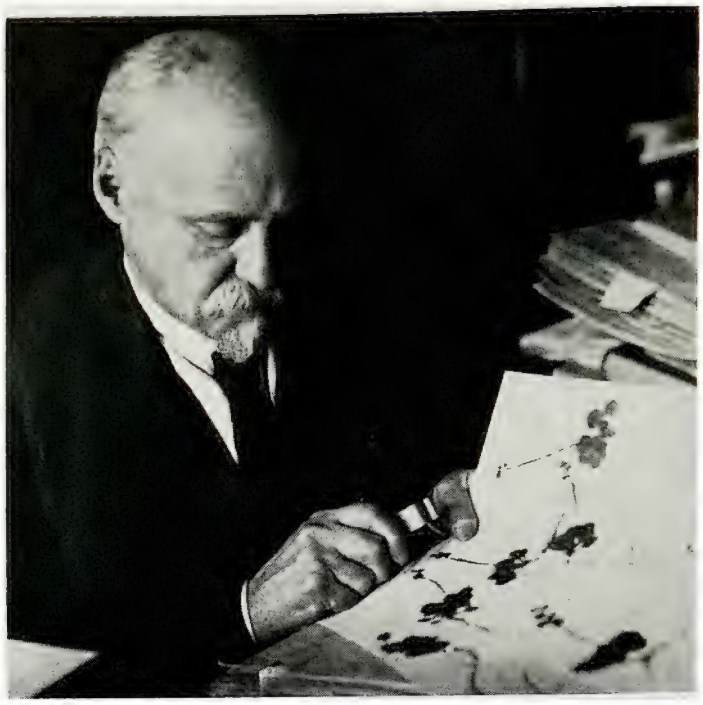
It is difficult to compare the size of the staff directly with that of an American institution, such as The New York Botanical Garden, because of differences in the administrative and educational organization. The distinction between students and regular staff is less sharp than in the United States, and frequently a botanist may obtain his doctoral degree through the Institute only some years after he has joined the staff. Still, the professional botanical staff must be one of the largest in the world, if not the largest. Some measure of its size may be had from the estimate that about forty people from the Institute are expected to contribute parts to the Flora of European Russia on which work is now beginning. A considerable number of the staff members, especially the younger ones, are women, in contrast to the relative paucity of women taxonomists in the United States.

The taxonomic leaders at the Institute are clearly just as competent, and just as cognizant of modern developments, as leading taxonomists in the United States or elsewhere. In one respect, at least, Russian taxonomy is ahead of our own: they have completed their multivolume Flora of the U.S.S.R., whereas there is no flora of the U.S.A., and The New York Botanical Garden's own multivolume effort on the North American Flora proceeds only slowly and is still far from complete. Counterbalancing this disparity is the paucity in Russia of the detailed biosystematic studies which make up such a large part of recent American taxonomic literature. The scientific climate in Russia during most of the past twenty-five years has not favored this sort of work. It is perhaps not surprising that narrow views of specific limits prevailed in Russia much longer than elsewhere. Russian taxonomy is only now undergoing the revolu-

Administration and Herbarium of the V. L. Komarov Botanical Institute, Leningrad. 1965.

Upper left. Alexander Fedorov (left), Director of the V. L. Komarov Botanical Institute; Armen Takhtajan (center), Sir George Taylor (right), Director of the Royal Botanical Gardens, Kew. Leningrad. 1964.

Lower left. Armen Takhtajan, with *Orobanche gigantea*, a non-green root-parasite. 1964.



Upper right. V. L. Komarov in the herbarium at Leningrad. 1932. Lower right. V. L. Komarov in Siberia, about 1920.

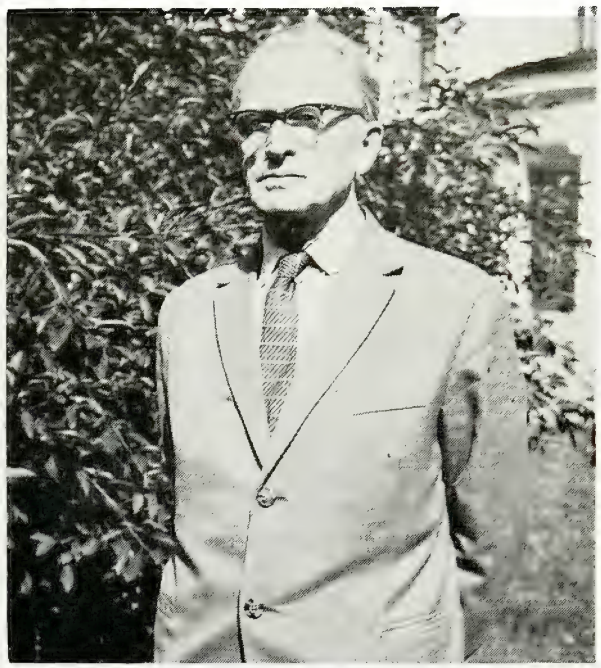
tion of ideas which began to be felt in the United States more than thirty years ago and which became irrevocable with the publication of the experimental studies of Causen, Keck and Hiesey in 1940. One hears that a much broader view of specific limits will prevail in the new Flora of European Russia than was shown in the Flora of the U.S.S.R.

The Botanical Garden is easily accessible by subway or bus. It is within the built-up part of the city, but far enough out so that one would not want to have to walk regularly from the city center. I did walk it a few times just to absorb the local atmosphere. The grounds of the Garden are pleasant to stroll through, with trees, lawns, and scattered ornamental plantings. Young mothers bring in their small children to play, and older people relax comfortably on the benches. As does The New York Botanical Garden, the Komarov Botanical Institute has some difficulty in getting all the garden help it needs, and the grounds do not have the well-manicured look which one sees in Kew or Edinburgh. Many of the gardeners are young women. One of the three who are shown in a picture accompanying this article approached me later and asked me to send her a print, which I did. It was no easy job for her to make her wishes known to me, since she spoke only Russian, and my Russian, after some three weeks in Leningrad, was still minimal.

The conservatory is larger than our own and is well cared for. It was largely destroyed during World War II, so that it had to be rebuilt and replanted. In the two decades since the War many interesting plants have been acquired, and one who had not seen the conservatory in prewar days feels no sense of loss or skimpiness. Groups of public school students are shepherded through

Left. Andrei Fedorov, near Leningrad. 1965. Dr. Fedorov is in charge of the work on the projected new Flora of European Russia.

Right. E. G. Bobrov, Leningrad. 1965.



the conservatory at frequent intervals by specially trained guides.

The library of the Institute is one of the great botanical libraries of the world. It is especially rich in rare old books which are now difficult or impossible to find elsewhere. Its holdings of modern taxonomic works in English are more restricted than our own, but they do reflect a serious effort to keep up, in contrast to the sparse coverage of Russian botanical literature at The New York Botanical Garden and elsewhere in the United States. Botanists and other scientists in most countries tend to rely heavily on the literature in their own language, as any examination of cited bibliographies will show, but the Russian botanists with whom I spoke are less sinful in this matter than many Americans, who tend to be a bit overconfident about getting along on English and a smattering of German and French. If American taxonomists could read Russian as well as some of the Russian taxonomists read English, American holdings of Russian publications would increase tremendously, and our work would profit from it. In my conversations with Takhtajan, I was much impressed to see that he could read anything I could, plus all the Russian work which is largely unknown to me. When people work with different sets of facts, it is not surprising that they sometimes reach different conclusions.

Aside from the general matter of increasing the friendly

Vera Vinogradova, near Leningrad. 1965. Miss Vinogradova, a student-staff member, is undertaking studies in the *Umbelliferae* under the direction of Dr. Tamamschian.

Sophia Tamamschian, near Leningrad. 1965. Dr. Tamamschian, recently retired, is a student of the *Compositae* and *Umbelliferae*.

Margarita Baranova; Novgorod. 1965. Miss Baranova, a student-staff member, is undertaking studies on *Populus* under the direction of Dr. Takhtajan.

Scene in the botanical garden. Leningrad. 1965.

contact between our countries, my visit to Russia was very fruitful because of the personal exchanges of thought. Concepts of relationships among the families and orders of flowering plants are now very much in a state of flux, as botanists in a number of countries struggle toward a new general system to replace the now moribund system inherited from the nineteenth century. The amount of information now available to contribute toward a new system is much greater than it was even a few years ago. Both Takhtajan and I have been working toward a new system. Some of his ideas and some of mine have been changed by our consultation. Hopefully, we may both live to see the general acceptance of a new system toward which both of us have made significant contributions.

Wherever Dr. Cronquist traveled, not only in Russia, but also in Finland, Norway, and northern Germany, he

Scene in the botanical garden, a portion of the conservatory in the background. Leningrad. 1965.

Near the entrance to the botanical garden. The statue is of Lenin. Television tower in background. Leningrad. 1965.

noticed in the cities a much greater use of cultivated plants—roses, peonies, begonias, petunias, snapdragons, and many other perennials and annuals—than are generally seen in American cities. Astilbes, which are grown in the suburbs in this country but rarely, if ever, in urban sections, made quite a showing in several city plantings.

The window boxes of private homes along city streets in western Europe, which were filled with annuals, brightened what might otherwise have been drab areas. Dr. Cronquist was also impressed with the colorful floral displays in parks and public squares in Leningrad, Helsinki, Hamburg, and several cities in Norway.

The Editor

Scene in the botanical garden. Leningrad. 1965.

CONVERSATIONS ON ECOLOGY XV

Dr. Alton A. Lindsey is a plant ecologist who has become well known as a teacher, research worker, and editor. He is a member of the scientific advisory boards of several conservation organizations. As President-elect of the Indiana Academy of Science, he is editing its special sesquicentennial volume on "The Natural Features of Indiana." It is therefore interesting to have him document the story of the Indiana Dunes as precisely as he does, since the present series of "Conversations on Ecology" concerns itself with the implementation of ecological principles in the practice of conservation.

THE DUNES LAKESHORE—
INDIANA'S STORM BEACH

West Lafayette, Indiana
November 9, 1965

Dear Pierre:

Among conservation causes the most suspenseful and interminable cliffhanger is the Indiana Dunes National Lakeshore. Since 1916 when Stephen Mather proposed a twenty-five-thousand-acre national park along the northwestern Indiana shore line, this Hoosier sandstorm has blown up into a conservation classic, because the opposing forces are so clearly defined and militant, and the stakes on both sides so high. Both its friends and foes, for different reasons, are working for an early vote in the House on the present bill, which provides for an 11,292-acre federal park under the National Park Service to be acquired for twenty-three million dollars.

The unique nature of the area goes back twelve thousand years to postglacial Lake Chicago, which was sixty feet higher and extended many miles farther south than the Lake Michigan of today. As the lake receded, it continued to lay up a series of great dunes at its narrow, southern end. In depressions, between the largely forested dunes, some of the lagoons and ponds developed into bogs, marshes, or swamps. About 1900, botanist Henry Cowles of the University of Chicago used the diverse, yet diagrammatic, terrain for his classic pioneer work on plant succession and habitat evolution.

After a public hearing in 1916, conducted by the Secretary of the Interior, the latter recommended a lake-side national park. A National Dunes Park Association was incorporated in Indianapolis in April, 1917, but the project was sidetracked by our entry into World War I.

Indiana citizens promoted the twenty-one-hundred-acre Indiana Dunes State Park and raised the funds with great help from Chicago residents. This state park was established in 1925, and, as the most popular state park in Indiana now, nets the twenty thousand dollars annually that helps maintain other parks in our system. The pending Lakeshore bill leaves it open as to whether the Dunes State Park would be acquired for inclusion in the Lakeshore; negotiations between the governments are authorized for this purpose, if the state consents.

The movement, also of long standing, for a major harbor in Indiana gained impetus by the advent of the St. Lawrence Seaway. Some prominent Hoosier ex-politicians profited from the land speculation near Burns Ditch during the 1950's. Promoters and officials visualized an unrivaled industrial complex and teeming population between Indiana Harbor at Hammond and the port at Michigan City, presumably excluding the small state park. Conservationists held to Carl Sandburg's view that "The dunes are to the Midwest what the Grand Canyon is to Arizona. They constitute a signature of time and of eternity: once lost, the loss would be irrevocable."

In 1952 the state division of the Izaak Walton League passed a resolution, supported by the national IWL, ". . . that the remaining dune areas should be permanently preserved for educational and recreational use of all the people and for posterity." The League has been very active in the Lakeshore campaign since that time.

Three steel companies have been directly involved. Company A has a finishing mill adjacent to the proposed harbor site on the west, and the Army Engineer 1960 report named it as the main reason for a tax-subsidized port there. Company B entered the Midwest lately by quietly and gradually acquiring forty-eight hundred acres adjoining the future port on the east. It built a large finishing mill there in 1963-5. Company C has only one steel-making plant, an older one at East Chicago, and no plans for others. But sixteen miles east of this it owns eight hundred acres which remain undeveloped. This company favored the park plan until 1964, when the revised Lakeshore bill included its isolated tract to counter the loss of Company B's land, where the argument had been settled by bulldozer. Now C objects to the taking of its land, but does not oppose the Lakeshore park as a whole. But park opponents have seized strongly upon the objection for use against the entire plan.

The Save-the-Dunes Council was formed in 1952 by a few women of northern Indiana who were moved by the accelerating encroachment of heavy industry with attendant air-and water-pollution. In that year much unspoiled dune country was still available at three hundred and fifty dollars an acre, but the women could not raise the money and the land was purchased by Company B. This tract, now the site of a steel plant acclaimed as "beautiful" in national magazine ads, had the best park potential because there the high dunes formed a lake-side band 1.2 miles wide, compared with the 0.4 mile width where the state park is located.

The SDC women early tried to interest Indiana officials and politicians in defending the dunes, without success. Only then did they turn to Senator Paul Douglas of Illinois, who had professed economics at the University of Chicago and had owned a cottage in the dunes. In Washington, Douglas talked with men from Indiana, promising his support if they would lead the move to avoid what he knew would be considered a foreign invasion of Indiana territory. The Eisenhower administration was opposed to the idea, and Douglas failed to enlist Hoosier help. Naturally, he has been ex-

coriated by Indiana editorial writers and politicians, though he made it clear from the start that he would use his influence to get a harbor for Indiana anywhere except at the Burns Ditch area, where the finest dunes still existed on Company B's acres. But state officials dug in at their "only feasible" site for the "public" port just between the lands of Companies A and B, one to be built very predominantly by United States and Indiana taxpayers. They turned aside the design drawn up by the Lake Michigan Region Planning Council of the American Institute of Architects, for an industrial complex and harbor inland behind the strip of high dunes. Senator Douglas has remarked: "Until I was thirty, I wanted to save the world. Between thirty and sixty, I wanted to save the country. But since I was sixty, I've wanted to save the dunes."

The tangled background of the port proposal was first revealed in an *Atlantic* article by William Peebles, "The Indiana Dunes and Pressure Politics," in February, 1963. This article caused little stir in our state, probably because the plot resembled an old-time, big business-politics melodrama too much to be believable today.

The SDC has had but one president, Mrs. James Buell of Portage, Indiana. There are about thirty-five hundred members, only a baker's dozen of whom I find also in the membership directory of the Ecological Society of America. The only paid worker is part-time, an attorney who represents the Council in lawsuits, such as the one designed to get access to state records of agreements between the state government and steel firms. The annual budget of the SDC runs about ten thousand dollars, and the organization is deeply in debt. Some contributors have endorsed their dividend checks from Company B stock over to the Dunes cause!

Besides a corps of untiring envelope-stuffers, the SDC has a central core of very dedicated and talented volunteers in northern Indiana, such as Thomas E. Dustin, a skilled journalist who writes the news releases. Robert Mann travels at his own expense to give color-slide talks. Herbert Read, an industrial architect whose father had pressed for the state park, heads the engineering committee. These engineers have put in thousands of hours making detailed engineering and economic analyses of the harbor plans. Natural scientists and economists serve as advisors. Their solid evidence, for which Senator Douglas assured a hearing in Washington, infused new hope into an apparently lost cause. It soon became clear that the 1960 Army Engineer feasibility report had resulted from a technical survey which consisted mostly in holding up a wet finger to find out how the political wind was blowing.

Called to Washington several times to discuss its findings with the Budget Bureau, the SDC engineering committee stimulated a thorough-going Bureau investigation instead of the usual act-of-faith acceptance of Engineer Corps reports. The Bureau confirmed the SDC contention that the true benefit/cost ratio was decidedly unfavorable. After this unprecedented factual refutation of the Corps, the dunes cause gained many influential supporters, including both Indiana senators, Representative J. E. Roush who later sponsored the Indiana Dunes National Lakeshore bill in the House, and the Kennedy administration. President Johnson confirmed the support.

An administration compromise was then worked out which was expected to please everyone because the two adjoining steel companies got all they asked for, and the park and port were tied together into an all-or-nothing legislative package. By swallowing the bitter park pill, the Indiana politicos could wash it down with a soothing draught of port. Part of this agreement was the Budget Bureau stipulation that was to insure actual economic rationality for the harbor. If both Companies A and B could guarantee to build fully integrated steel mills (blast furnaces as well as finishing plants) then at least five million tons of coal must go through the Burns Ditch port, independent of these plants. But if only one of the companies builds blast furnaces, there must be solid prospects of ten million tons of coal going out from the port to other lake ports. There were also antipollution assurances to be given to protect the park air and water. This last appears to be the real reason for continued opposition by industry. Pollution abatement is expensive, and the federal government would be expected to enforce antipollution standards.

The harbor site lies in Representative Charles Halleck's Congressional District in Porter County, and the park largely so. Halleck was not a party to the compromise, but the Democratic administration of Indiana was, albeit reluctantly, and still is so, under a new governor. Mr. Halleck has not yielded one inch in his last ditch fight against a federal park, contending that the state park is fully adequate now and forever.

The Lakeshore bill has passed the United States Senate in both the 88th and 89th Congresses, going through the second time in one minute. It was cosponsored by twenty-five Senators, which Secretary Udall called the greatest number ever to sponsor legislation for any unit of the National Park system. It has never come up for a vote in the House, but Interior subcommittee members attended a local hearing in Valparaiso, Indiana, on October 2, 1965. One strike against the Dunes is the Congressional courtesy tradition against inflicting any public project upon the district of a Congressman who opposes it.

Although the Indiana legislature had in 1963 spurned the governor's importunities for port construction funds, the state in 1965 authorized twenty-five million dollars for work to start in October, 1965, and the federal people are being pressured to pick up the tab for the rest of the estimated ninety-eight million. Ten million is to come from an increase in a state cigarette tax, a novel smoking hazard for dunes-loving users.

Lined up for the Lakeshore are all Hoosier conservation organizations, the bulk of labor in the Gary-East Chicago (Indiana) area including steelworkers' unions, many, if not most, educators and scientists, and most Democratic (at least) politicians on the national and state scenes. The Ecological Society of America and the Indiana Academy of Science have given their official

(Continued on page 59)

PHOTOGRAPHING THE GARDEN

By JOHN MARK PATEK

Mr. Patek is Chairman of the Standards and Ethics Committee of the American Horticultural Society and the special representative on standards for the Men's Garden Clubs of America, of which organization he is a former director. He is a member of the Men's Garden Club of Rochester, New York, of American Iris Society, American Rhododendron Society, and American Rock Garden Society; also of American Chemical Society, American Society for Quality Control, and American Society for Testing and Materials, Committee D-29, which establishes test methods and nomenclature on peats, mosses, humus, and related products.

A garden view in which a soft, mystical feeling is attained by distant objects being slightly out of focus.

WE HAVE ALWAYS been torn between horticultural interests and a desire to create a garden of artistic value. Over the years we have concentrated on one plant group after another. The problem has been to retain plant collections and at the same time attain effects which around the year are worthy of a photographic record.

Our garden is located on an exposed ridge facing Canada fifty miles to the north across Lake Ontario. Preconceived ideas of whether plants should be hardy, easy to grow, tolerant of soil, native or exotic have not deterred our selection of plant material. The angles of the house are used to create microclimates where hardy plants are located at exposed points and tender plants nestled at the base of slopes and in corners. Hardy pines, spruces, and firs take the cold winds, while in the protected areas are various dwarf rhododendrons, heathers, and hollies.

The use of suitable soils and mulches is considered along with exposure. For example, one bed is divided by metal edging on one side of which lime has been incorporated into the soil and a marble chip mulch applied; on the other side is a coal mulch. Saxifrage and clematis are happy with the marble mulch and a Japanese gray fern enjoys the coal mulch. The combination of white and black appeals to the camera.

At the base of our exposed ridge is a protected moist area which nature has been permitted to take over. A variety of native plants have appeared, including many photogenic ferns.

It is frequently a difficult problem to place an interesting plant without destroying the design of the garden. Ideally, each plant should fulfill a design purpose in the setting in which it is located. Plants can be shaped to fit them better into the overall design. Plants of mediocre interest can be studied to determine their growth characteristics and design possibilities, and these possibilities developed by pruning and training. Pyramidal plants can be made more pyramidal, irregular growth can be exaggerated, horizontal growth can be accentuated, mounds can be shaped, and fruit trees can be arched.

A plant is improved with training and appears best with props just as a singer does. Rocks make good garden props; so do mulches, fences, and walls. They support, delimit, separate, and accentuate. The use of rocks is a subtle art in itself, highly developed by the Japanese. A sense of randomness achieved by a "flock of geese and one stray one" helps to escape the "plum pudding" effect. The use of fences to establish unity is common in ancient Chinese paintings and can improve the photographic aspects of a garden. The Japanese use walls as backdrops, but the English also use them as supports. Mulches furnish color and texture, another art developed by the Japanese and featured in the work of many a photographer. In developing our own garden we have attempted to use all these props in a harmonious manner, and in so doing have increased the design interest of the garden. Of course, as will be described later, the plant material itself offers interesting patterns which a camera can record; patterns against the sky, in the rays of the sun, against the ground, and with snow and ice.

Color is fundamental in any garden, even though it might be limited to shades of green. Drifts of single colors are highly effective, but for the gardener who is interested in plant varieties, the solid drifts might be left to others. However, plantings may be arranged to give harmonious or contrasting effects worthy of photographing. For example, we have one garden bed with white, blue, and yellow iris, another with pink and lavender iris, and a third with yellow and brown iris. Better color photographs are taken with yellow than with blue, pink, and lavender.

We have obtained some striking contrasts in complementary colors with flowering shrubs. A violet-pink *Rhododendron mucronulatum* is planted in front of two shrubs of forsythia 'Spring Glory'. No photograph has reproduced satisfactorily the color of the rhododendron. For later contrast a pale yellow Warminster broom, *Cytisus praecox*, is placed in front of the violet-colored lilac 'Captain Baltet'. Unfortunately, the incompatible textural difference between the broom and the lilac is more obvious to the camera than to the eye. In other

Shadows on the lawn produce interesting patterns.

Wild ferns in the low terrain are highly photogenic.

words, the colors are good, but the camera shows the textural design to be poor.

One who desires to record the ever-changing designs and colors of a garden need only have a simple camera, but he must appreciate and be alert to what his garden can offer photographically. Such fleeting sights as sunlight through a rose petal, a leaf pattern against the sky, snow on overwintering berries, or long shadows across the lawn require a camera loaded and ready to use.

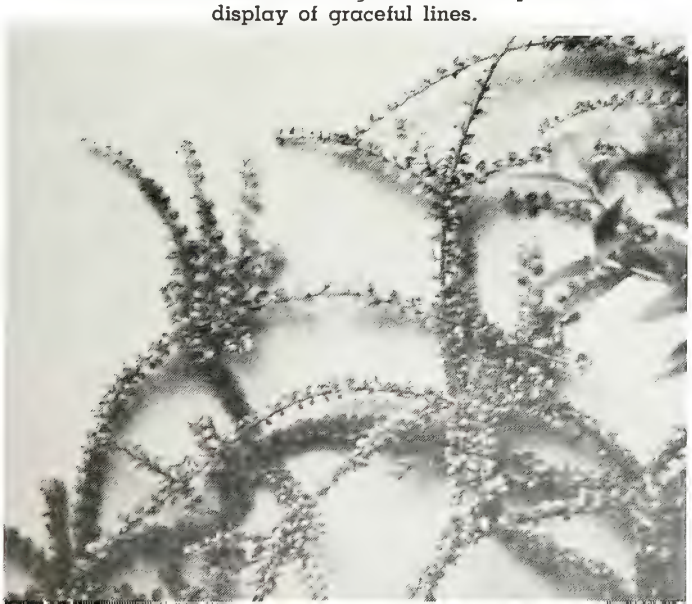
Pictures will improve with experience and some self-education regarding the photographic equipment in use or available for use. The most difficult problem in small garden photography is the ever-present, too busy background. Besides the disturbing effect of telephone wires, there are the further distractions of neighboring structures and a miscellaneous confusion of surrounding vegetation. It is often well to avoid inclusion of the sky, or sometimes the ground as a step toward simplification.

The too busy effect in garden pictures not only results from confusion in the background, but from a natural desire to capture too many beauties in a single frame. It is usually better to concentrate on a single group of flowers than to divide attention between several, particularly if they are not well related. A disturbing background can be blurred by the use of a large lens opening and a short exposure time. An object of interest can be accentuated by waiting for the moment of the day when the sun spotlights the object. Further aids are artificial lighting or mirrors to reflect natural light on the object. The insertion of a paperboard screen behind a flower is commonly practiced in garden photography.

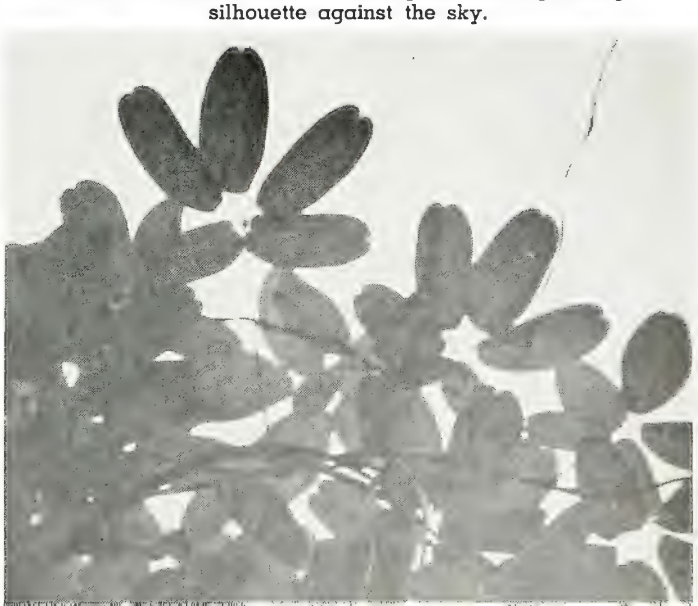
There are times when an out-of-focus background is desirable, but there are other times when sharpness in depth is required. Then the picture should be taken at as slow a speed as the movement of plants allows, so that the lens opening is small and the background sharp. It is common practice to focus on the nearest object, but when it is desired to preserve sharpness of the far background, it may be preferable to focus on a point about one-third the distance to the farthest point. There may be some added charm in not having the distant objects precisely in focus, or no harm in having the nearest objects out of focus.

Perhaps the most difficult problem in photographing an expanse of flowers in the average garden is in avoiding a picture which shows a broad lower band of foreground lawn, a narrow middle band of flowers, and a broad upper band of sky. To prevent this, a picture can be taken in the long direction of the border. In such a shot the sky may be eliminated entirely. Looking down, if possible, from an elevated position will be helpful.

Cotoneaster horizontalis hugs the wall to produce a display of graceful lines.



Akebia quinata over a stairway creates a pleasing silhouette against the sky.



Pyrancantha coccinea is trained against a wall in an attractive pattern.

A Moerheim spruce at the base of a Hicks yew makes a striking contrast in color and form while retaining unity by similarity of texture.

Finally, it may be necessary to crop the picture in order to eliminate some of the sky, some of the lawn, or both.

In photographing our own garden, we have been particularly interested in the artistic effects created by woody plants and in the design patterns which they reveal on the ground, against the walls of the house, or against the sky.

Cotoneaster 'Liaking' makes an interesting ground decoration, and *C. horizontalis* will follow over a rock or up a wall. The low, spreading heathers make interesting ground covers. *Calluna vulgaris* 'Mrs. R. H. Gray' makes an attractive mat and is the one variety that has withstood many winters, because it is flat enough to be protected by a minimum of snow.

Some leaves are particularly pleasing when viewed against the sky. This is especially true if they are sharp in outline and present a distinctive pattern. We have an outside stairway over which *Akebia quinata* has been allowed to extend itself from an upper hand rail. The five-lobed leaf of this vine presents a particularly pleasing design when viewed from the stairway below. The lower outside walls of our house are of smooth cement over cinder block and make an excellent background for plants trained against them. Boston ivy, *Parthenocissus tricuspidata,* makes an interesting winter pattern, and its small-leaved variety *lowii* makes a lacy summer display when thinned. *Cotoneaster horizontalis* as a wall plant was mentioned above. *Pyracantha coccinea,* held against the wall with wires, has been trained into a design which never fails to draw comments.

Striking color contrasts can be attained with foliage. Opinions differ as to whether such contrasts are in good taste. Sophisticated opinion does not favor colored foliage. Analagous hues can produce effects within the realm of good taste. Perhaps it takes more sophistication to use colored foliage properly than to be on the safe side and arbitrarily reject it.

Plants with distinctive characteristics please the most. Distinctive forms may vary from extreme irregularity to precise symmetry. They may be distinctly rigid or distinctly arching. Characteristics of age are more admired in plants than in humans. One corner of our garden is always admired, because it employs striking contrasts in color and form, but unity in the plant texture. The background plant is a somewhat formal-looking, dark green Hick's yew at the base of which is a silvery Moer-

A coal mulch is separated by metal edging from a marble chip mulch. Small acid-loving plants grow in the coal mulch and lime-loving plants in the marble mulch.

Calluna vulgaris 'Mrs. R. H. Gray' makes an interesting mat on the ground. The picture was taken looking down at a distance of about thirteen inches with a Kodak Instamatic 500 camera and close-up lens.

heim spruce, a graceful arching variety of *Picea pungens*. In front of this is a water-worn boulder of dark red slate.

We have a collection of flowering crab-apples, no two of which are the same variety. From an artistic standpoint, a single row of trees is not very satisfying, but we are now gradually creating what promises to be a pleasing composition. A rail fence now parallels the trees, an idea borrowed from a Chinese painting. The posts repeat the pattern of the trunks. The tops of the trees are being pruned so as to arch, and we hope to attain eventually a design of arching branches in contrast to the horizontal rails of the fence.

The photographic record of our garden continually draws attention to our failures and successes. Gradually and imperceptibly, our garden improves in one area and declines in another. Often an old photograph draws us up short. It says unmercifully, "Clean out the bed and start over."

CONVERSATIONS ON ECOLOGY (Continued from page 55)

blessing. Opponents are Representative Halleck, Companies A and B, and labor unions in the construction trades. Town councils in the affected region are divided, although sentiment has become increasingly favorable, as the facts have percolated through the filter of newspaper bias. At the Valparaiso hearing in the heart of enemy territory, the six Congressmen saw that about eighty per cent of the full house favored the park.

Great quantities of dune sand bulldozed in the last few years from the finest duneland were conveyed on barges across the Lake to a university at Evanston, for landfill to extend the campus into Lake Michigan. Thus, the lost dunes continue to serve an educational purpose.

Recently, the port-park package has become untied, but Congress has stipulated that the port cannot be authorized until the park has come to a vote in the House, not necessarily passed. Thus, opponents have made a successful end run around the Budget Bureau conditions and the administration compromise. None of the conditions have been fulfilled. But now both groups want the Lakeshore bill brought to the floor. The SDC feels confident that some kind of Lakeshore will pass, but the boundaries may be retrenched by Congress. The area owned by Company C may be deleted and carry with it four other non-contiguous pieces of primarily natural history interest. This is unfortunate, since no one really minds the inclusion of these marshes, bogs, ponds, and river flood plains, and many scientists favor having them.

Even assuming total defeat of the park bill, the SDC has given many thinking Hoosiers some new ideas—that a matter of values cannot be expressed in a benefit/cost ratio, that conservation forces can be as militant as needed to get a fair hearing for irrefutable facts, and that a bureaucratic agency loaded with know-how but short on know-whether can be successfully contradicted by "bird-watchers and posy-pickers."

Conservationally yours,
ALTON A. LINDSEY, *Ecologist*
West Lafayette, Indiana

A row of flowering crab-apples is tied into a unified design by a rail fence which repeats the trunk pattern, the horizontal rails contrasting with the branch pattern.

FUNDAMENTALS OF BOTANY SERIES

These two texts* add to a growing list of paperbound materials available to students and teachers in introductory biology courses; both are worthwhile additions.

Billings begins his text by defining ecology and indicates three principal kinds of ecological systems (or levels of integration): 1) the individual, 2) the population, 3) the ecosystem. The ecosystem is defined as the "energy-driven complex of a community of organisms and its controlling environment," and the point is made that at the levels of the individual and the population one can speak of plant and/or animal ecology, ". . . but the interactions of the ecosystem involve all kinds of organisms in a complex community whose understanding requires a broader viewpoint, that of ecology itself."

Environment is introduced in a variety of subject headings, and the integration of the environment makes excellent use of the works of Geiger and Gates. Vegetation is treated briefly as a measure of the total environment, but the definition of vegetation in the glossary (defined as the actual plant covering of an area) is certainly an oversimplification. The chapter on the individual plant and its environment makes good use of the author's experience with *Oxyria* as he considers, in order, germination, vegetative growth, and flowering and fruiting. The discussion of the geographic distribution of plants outlines explanations for the present distribution of species and relates structure to these present distributions. Included is a brief survey of the paleoecological events which have given rise to the present distribution of plants in North America.

The handling of the structure and classification of plant communities is far oversimplified and, both in the text and the suggestions for further reading, some elegant works on the structure and the structural approach to classification have been totally ignored. Some of these papers would be brought to the reader's attention, however, through the references provided for community sampling, e.g., Cain and Castro's 1959 *Manual of Vegetation Analysis*. There is a tremendous gap in the level of information provided in the chapter and that to be found in certain of the cited references, i.e., Grieg-Smith's *Quantitative Plant Ecology* (1957).

Previous chapters and their relationships to each other are then digested in an excellent introduction to ecosystem dynamics, and the problems involved in considering a balanced ecosystem are introduced to the reader with a word of caution concerning the removal of any or all the limiting factors which govern the ultimate direction of the system involved. Billings then considers certain terrestrial ecosystem types, ranging from tropical rain forest to cold deserts, and gives a brief description of the general environmental conditions for each of these climax ecosystem types, climax vegetation being defined as "relatively stable vegetation in equilibrium with its environment and with good reproduction of the dominant plants." Only in his discussion of temperate deciduous forests, however, is any detail given to the outline of the structure involved and no quantitative descriptions are presented in order that the reader may compare types on a structural basis.

The book terminates with a chapter on the role of ecology and man's welfare, in which the final two lines make an excellent plea for the continuing training of young ecologists: "In a world of uncertain existence and changing environments, there is a need for the broad view of the ecologist and his knowledge of holocoenotic ecosystems. Perhaps this is the greatest contribution that ecology can make to our common welfare."

Perhaps the weakest portion of the book is the glossary and index, the former often duplicating many definitions given in the text or oversimplifying the case in point, the latter being somewhat inadequate for the amount of material in the text. As previously indicated, this book should serve as an excellent text at the introductory college level for the student of biology or the lay reader concerned with the "effect of man on natural ecosystems," "modified ecosystems," or the "synthetic ecosystems" created by man, all topics found more and more frequently in the popular press.

The second of these two volumes, *Plants and Civilization,* is intended to relate the importance of plants to man's social and economic development and the equally important consideration of man's role in the modification and distribution of plants, and this the author accomplishes in an admirable fashion. In fifteen chapters ranging from "plants and prehistory" to "the future of plants in relation to man," Baker presents an introduction to such varied topics as the role of plants in stimulating exploration and exploitation, beverages and the emergence of tropical nations, fermentation, and the utilization of drug plants.

Other chapters are devoted to wheat (of Old World origin), maize (of New World origin), and legumes and oils, all under a general heading of necessities. Each of these chapters presents a brief history, a current status, and a glimpse into the future plant-breeding of each crop under consideration. A brief review of the history and principles of plant-genetics is included in the chapter on maize. The chapter on sugar (here considered a luxury as compared with the carbohydrate sources) considers the diversity of sugar sources, i.e., sugar cane, sugar beets, and sugar maples, as well as other sugar cane substitutes.

Tea, coffee, and cocoa or chocolate are included in a chapter which points out one of the most common problems concerning the development of tropical lands: the economic dependence on a single plantation-type crop in which the failure of that crop in any given period most often has serious political and social implications. The story of rubber (a crop termed indispensable by the author) follows this same pattern of development, and

(Continued on page 79)

*Plants and the Ecosystem. W. D. Billings. Wadsworth Publishing Co., Inc., Belmont, California, v + 154 pages, illustrated, indexed. 1965.
Plants and Civilization. Herbert G. Baker. Wadsworth Publishing Co., Inc., Belmont, California, v + 183 pages, illustrated, indexed. 1965.

REFLECTION RIDING

By DOROTHY EBEL HANSELL

1. U. S. Point Park, elevation 2,164 feet.
2. Residential area on Lookout Mountain.
3. Tennessee River, width one-fourth mile.
4. Moccasin Bend.
5. Four-lane U. S. highway.
6. Union Army of three thousand crossed Lookout Creek here.
7. Indian Profile on Sunset Rock.
8. Chickamauga Dam with lock.
9. Business area of Chattanooga, Tennessee.
10. Walking and riding trails, maintained by National Park Service.
11. Reflection Riding.

"IN AN AGE DIVORCED from the life of the soil, we need nature, not as a refuge, but as a sustainer," wrote Christopher Tunnard. And this aptly applies to Reflection Riding—a scenic drivethru of botanical, geological, and historical interest, which is located only six miles from the bustling, thriving city of Chattanooga.

Within minutes, one may leave the tensions and pressures of daily living and keen competition and find refreshment in a beautiful and tranquil setting. Here, according to his own inclination, one may enjoy at a leisurely pace the wealth of native plants, birds, and other wild life; the unusual rock formations; the sites of historical significance. Or he may simply relax and quietly reflect on nature's beauty, since the entire tour is by car. This riding is an instance of happy motoring —here one's car is a real delight.

Reflection Riding, originally Sunset Rock Farm, was purchased some years ago by John A. Chambliss of Chattanooga, thus saving it from becoming an industrial site. Later Mr. Chambliss conceived the idea of establishing a "modified arboretum of native trees and shrubs" and wild flowers. The three-hundred-acre tract is nestled against Lookout Mountain, which surrounds it on three sides, and is directly below famous Sunset Rock. Rising some twelve hundred feet above Reflection Riding is the Indian Profile—a thirty-five-foot face, with a prominent hooked nose, which has been carved by natural causes down through the years out of the sandstone top of the mountain.

Lookout Creek, running along the westerly boundary of this property, was forded by the troops of six states —Illinois, Indiana, Kentucky, New York, Ohio, and Pennsylvania—on their way to storm Lookout Mountain on November 24, 1863. Because of the heavy fog which enveloped the area, this hard-fought engagement between Union and Confederate troops is known as "The Battle of the Clouds." The battle actually began on the land now called Reflection Riding and ended two miles away and eight hundred feet higher at Craven's House. Historical markers point out other incidents of the Civil War—Rickard's Reflection, Candy Flats, Millison Field, and so on.

But Reflection Riding's history goes beyond the Civil War to the days when the Cherokee Indians moved into Lookout Valley to live peacefully, before white men arrived to engage them in conflict and eventually to drive them out. Markers tell of the defeat in 1788 of five hundred pioneers by the Indians.

Creek and swampland, flooded when the water rises, flower-filled meadows, pastures, woods, and massive rocks and ledges furnish fascinating and varied terrain and diversified habitats for plants. As I was driven by my hostess Mrs. Chambliss along the road on the upper reaches of Reflection Riding, I caught glimpses of the Cumberland Mountains in the distance and other unspoiled natural scenery through well-planned vistas. Dogwood, sour-gum, sweet-gum, sourwood, and tuliptrees or tulip-poplars, as they are called in Tennessee, were in full fall color in the woods. Never have I seen so many sourwood trees in any one place. And I also noticed redbud, maple, hickory, wild cherry, sassafras, black walnuts, oaks, pines, and hemlocks. Over forty different trees and close to one hundred other plants—shrubby and herbaceous—are to be found within this preserve. The shrubs include azaleas *(Rhododendron calendulaceum, R. nudiflorum, R. vaseyi),* lamb-kill and mountain-laurel *(Kalmia angustifolia* and K. *latifolia), Rhododendron carolinanum, R. catawbiense,* and *R. maximum,* silver-bell *(Halesia monticola),* shadblow *(Amelanchier),* huckleberry *(Gaylussacia),* blueberry *(Vaccinium), Viburnum,* wild roses, and others too numerous to mention.

There is a host of wildflowers. Spring finds blue-eyed Mary *(Collinsia verna), Dodecatheon, Houstonia, Hepatica, Iris cristata,* blood-root *(Sanguinaria canadensis),* foamflower *(Tiarella cordifolia), Trillium* (five species), bird's-foot violet and other violets; and these are followed by goat's-beard *(Aruncus sylvester), Campa-*

Lookout Mountain across a stretch of land in Reflection Riding. This bears the name of Col. Charles Candy of the 66th Ohio, who was ordered to the "flats" with his troops to "scour the fields."

nula americana, black snakeroot, *(Cimicifuga racemosa), Lilium canadense* and *L. superbum,* cardinal-flower *(Lobelia cardinalis)* and *L. siphilitica,* starry campion *(Silene stellata),* blackberry-lily *(Belamcanda chinensis),* black-eyed Susan, coneflower, and Queen Anne's lace.

Galax aphylla and ferns carpet the ground. Resurrection-fern *(Polypodium polypodioides),* lichens, and mosses cover massive rocks.

Gordon D. Cooper, the well-known landscape architect of Cleveland, Ohio, whom Mr. and Mrs. Chambliss consulted in the development of Reflection Riding, was very much impressed with the vegetation. In his report he states: ". . . Rising as it does out of the valley floor and lying between the Cumberlands and the Unakas, its position comes at a point near the junction between the Chestnut-Oak-Yellow Poplar-Rhododendron Forest to the north and the Oak-Pine Forest to the south. Evidences of the existence of both these native forests may be seen on the top and sides of the Mountain . . .

". . . there are probably at least ninety-two species of native trees on the Mountain together with a large number of other woody plants such as shrubs and vines, ferns and herbaceous plants, which are characteristic of this plant province. Not only is this vegetation profuse but it is also outstanding, especially to a visitor from

Along Reflection Lane, wooden markers clearly indicate the location of wild flowers.

The Cumberland Mountains furnish an impressive background for Rickards Reflection, the pond named after Col. William Rickards of the 29th Pennsylvania and commemorating another engagement between Union and Confederate forces.

another part of the country, because of its many plants which are handsome and unusual either on account of their flowers, autumn colors, or fruiting effect or because, when growing in their natural habitats, they show up to much better advantage than elsewhere."

Reflection Riding is fortunately situated in that it is adjacent to a National Park—the Chickamauga and Chattanooga Military Park. This great park was named and its miles of trails were made before the federal government acquired it. About forty years ago the late Adolph Ochs headed a ten-year purchase and development plan, the outcome of which was ownership by the National Park Service of some eighteen hundred acres, rich in natural beauty and in places of significance both in Indian tradition and history and in the history of the "War between the States."

In order to protect Reflection Riding on its one exposed boundary, Mr. Chambliss arranged for an easement with the Louisville and Nashville Railroad Company whereby "Reflection Riding has the perpetual right to plant and maintain a screen of trees" upon a strip of land along the westerly side of Lookout Creek. In this way the operations of the railroad yard do not intrude upon the view, and the area is guarded from possible future industrial encroachment.

Reflection Riding Lectures are given periodically be-

One of the well-planned vistas which have been cut through the wooded upper reaches of Reflection Riding to reveal the distant Raccoon Mountains of the Cumberlands.

fore the Royal Society of Arts in London, on "aspects of landscape amenity"; these lectures are endowed by Mr. Chambliss. The inaugural lecture was presented on November 22, 1961, by Sylvia Crowe, Past President of the Institute of Landscape Architects and one of the founders of the International Federation of Landscape Architects. It was published in the *Journal of the Royal Society of Arts* and *The Smithsonian Report* for 1962, from which the following is quoted:

"Where the landscape suffers as a result of civilization, either the ideals of civilization are at fault or it is a sign that the whole of the truth has not been grasped, that some angle of life has been neglected, some secondary interest overstressed. This lack of balance is evident both in individual countries and in the world as a whole. For the balanced landscape must be seen as a world concept. If 'no man is an island entire of itself,' still less is any country. We can no longer countenance the rape of one part of the earth's surface to supply riches for another. Nor the desecration of one part to provide a playground for another.

"But within this balanced universal landscape we need also the full richness and variety of local ecology, without which the evolution of both life and thought must stagnate.

"Perhaps no country has seen such rapid and extensive inroads into hitherto wild landscapes as the United States of America . . . a land untouched by civilization has been subjected in the course of two centuries to the most rapidly expanding economy the world has ever seen.

"As a result the two facets of man's relationship to the landscape, man the destroyer and man the creator and preserver, can be seen in acute conflict with each other. While in some places the heritage of a unique landscape is being destroyed by unplanned development, in others new and magnificent landscapes are being developed. The T.V.A. still stands as a supreme example of a landscape manipulated for the full enjoyment of men as well as for the creation of material wealth. Yet perhaps America's best-known contribution to the reconciliation of civilization and landscape lies in her national parks. . . . First, by care, by knowledge, and by devoted service, the complete ecology of great areas of natural landscape is being preserved. Second, by education within the parks, townpeople are learning to understand and respect wild nature. . . .

"Reflection Riding, Tennessee, shows the skill and understanding with which a place of natural beauty can be made available for the enjoyment of many."

TREES, SHRUBS, AND ARCHITECTURE

By Robert L. Baker

Dr. Baker is Assistant Professor in the Department of Horticulture, University of Maryland. This article is the result of observations made while teaching the course in "Woody Plant Materials" at the University.

(Continued from January-February, 1966)

In addition to the relationship of forms, there is also a relationship of *textures* between building and plant. Texture refers to the surface appearance of the plant and is usually dependent upon the size of leaves. Plants of coarse texture have relatively large leaves, as *Catalpa, Paulownia,* and many magnolias. Plants with small leaves or feathery foliage, such as honey locust *(Gleditsia triacanthos), Tamarix,* and most conifers, are fine in texture. These terms are relative, of course, since the same plant may appear coarse or fine in texture, depending upon the foliage of adjacent plants. Texture refers to a visual effect which does not necessarily correspond to actual leaf size. The compound leaves of Kentucky coffee tree are two to three feet long, but the small leaflets and wide spacing of leaves give the appearance of relatively fine texture. Deciduous plants may show a progressive development from fine texture and open mass in the spring to coarse texture and dense mass by midsummer. Seasonal changes in the growth of flower buds into flowers and fruits create further textural interest within the plant itself.

Texture is closely related to density and form. The overall appearance of a plant may be described as rough or smooth, depending upon the number of projecting branches. The effects of light and shadow on the foliage masses of an open plant accentuate the penetration of space into the mass of the plant. Thus the Virginia pine and ginkgo are rough in outline, while such dense trees as littleleaf linden and horse-chestnut are smooth.

Just as the structural form of deciduous trees is revealed in winter, so a new textural feature is to be seen in the characteristic bark of many species. The smooth, gray-white bark of red maple and American beech are well known, but *Prunus serrula* with its glossy brown bark is rarely cultivated. Other trees, such as shagbark hickory, have very rough bark, or bark segmented into small plates as have the flowering dogwood and persimmon. The sweet gum *(Liquidambar styraciflua)* and winged euonymus *(E. alatus)* have thin, corky wings and ridges along their branches. Exfoliating bark may produce an interesting pattern of different colors as in crape-myrtle, sycamore, Chinese quince, stewartia, river birch, and paperbark maple *(Acer griseum). Metasequoia,* bald cypress *(Taxodium distichum)* black locust *(Robinia pseudoacacia),* and many honeysuckles have

fibrous or deeply furrowed bark. Still other woody plants are remarkable for the unique color of their bark: green with white lines in the striped maple *(Acer pensylvanicum)*; the snow-white of paper birch; the green stems of *Kerria* and hardy orange; and the red or yellow branches of *Cornus stolonifera*. In all, the contrasts and similarities in texture and color to various building materials are obvious.

Leaf surface is another aspect of texture. It may be smooth and glossy (southern magnolia) or dull (rhododendron) or rough and wrinkled in appearance (leatherleaf viburnum, *V. rhytidophyllum*). Reflection of light adds another dimension to the texture of plants with glossy leaves, a quality which fluctuates with light intensity and air movement. Wind movement of leaves creates interesting color effects in plants whose lower leaf surface is of a color different from that of the upper surface. White poplar, silver maple, and swamp and bigleaf magnolias *(M. virginiana* and *M. macrophylla)* are good examples.

Also resulting from the branch density and form of trees is an aspect of texture which is seldom appreciated —the decorative shadow pattern cast on the ground or on smooth wall surfaces. As is the nature of ghosts and shades, these patterns are ephemeral, changing with light intensity, air movement, season of year, and growth of the plant. They greatly enliven the winter landscape by producing bold, dark lines from stout branches like those of the staghorn sumac or Kentucky coffee tree, or a feathery tracing of lines from ironwood or Japanese maple. These patterns may ornament severely plain walls of buildings without breaking the continuity of structural form.

Color of foliage, flowers, and fruit is an extremely important factor in the relationship between buildings and vegetation, but it is also one of the most difficult because it varies with the season, density of plant, and other factors. Some deciduous trees are noteworthy for their foliage colors which are quite different in spring, summer, and autumn. Thus the same tree may serve as a unifying or contrasting element in the design at different times of year. Even more prominent are those trees with profuse flowers of brilliant color, such as crabapples, cherries, and saucer magnolia *(M. soulangiana)*. Although less conspicuous, many evergreen plants exhibit seasonal changes in foliage color. Such broadleaved evergreens as *Pieris* and *Photinia* have red-orange young leaves, while others, such as *Mahonia* and *Leucothoë,* take on a bronze-maroon hue during the winter. Some needled evergreens also change color; the Waukegan juniper turns from blue-green to purple in winter, while the American arborvitae is yellow-green in winter and dark green in summer. These color changes should be carefully considered when placing plants in combination with other plants, or when planting them against buildings. Some evergreen plants are constant in color throughout the year. The gray-blue-green foliage of conifers such as Hetz juniper, Atlas blue cedar *(Cedrus atlantica glauca),* Deodar cedar *(Cedrus deodara)*. Colorado blue spruce, and Himalayan pine may be relied upon for effective use with gray stone or other building materials of similar color. Plants with non-green foliage (gray, blue-green, bronze-red, yellow) are always prominent, offering great potential for imaginative use as contrasting or blending elements. Unfortunately, they are usually seen as single specimens on a lawn where they relate neither to the mass nor color of buildings and other vegetation.

Effective combinations of plants and architecture are dependent upon the harmonious or contrasting elements of form, mass, texture, and color of the building and the plant. In Washington, D.C., *Magnolia grandiflora* is successfully used with the classical federal buildings. Its dense mass of evergreen leaves and branches to the ground produce a year-round effect of great visual weight and solidity comparable to that of the massive buildings. The coarse texture of the foliage is also in proportion to the large scale of the buildings. The same

The foliage of the winged euonymus, *E. alatus*, has a soft textural effect. In winter, the branches with their thin, corky wings and ridges furnish the textural feature.

The small leaves of the *Tamarix* are fine in texture.

plant would stand in contrasting relationship to a low structure with horizontal lines and glass walls; however, the danger arises of the building being overpowered by the plant. Trees of open mass, horizontal form, and fine texture, such as honey locust and mimosa, are more in keeping with a building of open and delicate character.

In the limited space of a courtyard or small garden a tree with single trunk, ascending branches, and relatively fine texture is desirable. A small, enclosed courtyard affords an opportunity for small-scale compositions, using plants with interesting bark or branching which might not be noticed in a larger landscape. Such compositions derive their effectiveness from the relationships between plant forms and texture and those of the enclosing walls or paving. The smooth, gray bark of service-berry *(Amelanchier),* ironwood, Japanese maple, and yellow-wood *(Cladrastis lutea)* blends well with gray flagstone or slate paving. A harmonious relationship may also be seen in rough gravel and in the rough bark of the cork tree *(Phellodendron)* or flowering dogwood. The flaky, light brown bark of the river birch may be used effectively with exposed aggregate paving or wall panels of similar texture and color. Smaller trees of irregular open habit, such as *Aralia,* smooth sumac, or contorted willow (*Salix matsudana* 'Tortuosa') are valuable in such areas for the interesting shadows they produce on walls or paving. Their somewhat bizarre lines are accentuated against a plain wall surface.

Building materials may be natural, such as stone and wood, or man-made, such as brick, glass, steel, aluminum, and stucco. The physical similarities in color and texture between unpainted wood or rough stone and the bark of many trees and shrubs are obvious and easily appreciated, especially in winter. The rough bark of an ancient Boston ivy vine clinging to a Gothic stone building is a case in point. A fine example is to be seen at Dumbarton Oaks in Georgetown, where the roots of an old copper beech have grown around smooth, gray rocks of almost identical color, texture, and form. Brick of various earth colors, especially as it ages, also bears a close resemblance to bark. These "natural" building materials readily lend themselves to harmonious combinations with plants because of the variations in shape, texture, and color inherent in each. This is epitomized in the picturesque stone architecture of the Cotswold Hills in England. These low buildings of irregular plan, with slate roofs dotted by fern and sedum, are truly "organic" in their close relationship to the natural environment around them. They seem to grow out of the soil along with the climbing roses and ivy which cover their walls.

With other building materials it is more difficult to achieve such a happy blending of textures. In contemporary design utilizing glass, steel, and aluminum, unity between architecture and vegetation is to be found in line and mass rather than in texture. These materials in association with the simplicity of form of contemporary architecture provide a good background for contrasting textural qualities in plants. The bold foliage of leatherleaf viburnum, yucca, and *Mahonia bealei* is most striking when planted against a smooth wall surface. Large areas of windowless, light-colored walls may be relieved by the almost sculptural effect of distinctive trees with open mass or rough form, such as Deodar cedar, ginkgo, and weeping cherry. Clinging vines and espaliered plants also furnish effective contrasts on smooth walls.

The exfoliating bark of Stewartia creates an interesting pattern of different colors in winter after the leaves have fallen.

FOLIAR FEEDING

By P. P. Pirone

Dr. Pirone is Senior Plant Pathologist of The New York Botanical Garden.

The practice of supplying nutrients to plants by means of leaf sprays remains controversial even today. Some agronomists still question its value, while others, including horticultural scientists and persons like myself, know from actual experience that more vigorous plants and greater yields of flowers and fruits very often result from additional feeding with such sprays.

History

Plants have absorbed some nutrients through their leaves ever since plant life began on earth. Whenever a thunderstorm occurs, some nitrogen is precipitated with the rain. Minute quanities of other substances, contained in dust-ladened air, are also dissolved and brought down in rainfall. Moreover, epiphytic plants, that is, plants which live in trees usually in tropical areas, secure most of their food via the leaves.

In ancient times watery infusions of barnyard materials (liquid manure) were sprinkled or smeared on the foliage and branches of fruit trees. During the nineteenth century, English gardeners applied a watery suspension of soot to the leaves of cucumber and related plants to increase the plants' vigor.

The practice of foliar feeding as we know it today, however, is of quite recent origin. The plant nutrients now available are highly concentrated, completely soluble in water, safe to use on foliage, and pleasant to handle.

If one individual could be selected as the moving force behind the modern way of feeding plants, it would be the late Thomas P. Reilly of Dansville, New York, a member of one of America's early tree-growing families. Early in this century Mr. Reilly began to experiment with high analysis, completely soluble plant foods which could safely be applied as foliage sprays. By 1932 he had perfected his product and named it "Rapid-gro." This was the first complete chemical fertilizer to be made commercially available for spraying on trees, shrubs, flowers, and food plants.

Scientific corroboration of Mr. Reilly's early observations that plants could benefit from foliage applications of nutrients has appeared in recent years. Most notable was the work with radioisotopes at the Michigan Agricultural Experiment Station under Professors Tukey, Wittwer, Bukovac, and others. Plant foods containing nitrogen, potassium, calcium, phosphorus, and other elements were made radioactive and were thus "tagged." When such materials are sprayed on the leaves, the radioactive particles are absorbed, distributed, and utilized by the plant in the same manner as are the normal ingredients. Since the radioactive materials can be detected later by radiation counting, with X-ray film or other special apparatus, the exact amount of nutrients absorbed or utilized can be measured.

The Michigan State scientists were among the first to report that leaves are not completely covered with a

Fig. 1. Diagrammatic representation of leaf epidermal cells and cuticle. Modified after Wittwer, 1963. (Drawing not to scale). (a) stoma, (b) stomatal opening, (c) stomatal cavity, (d) chloroplasts, (e) cuticle interspersed with pectinaceous substances, (f) vacuole, (g) hair, (h) ectodesmata, (i) protoplasm, (j) plasmodesma, (k) intercellular space, (l) nucleus, (m) cellulose cell wall, (n) pectic lamella.

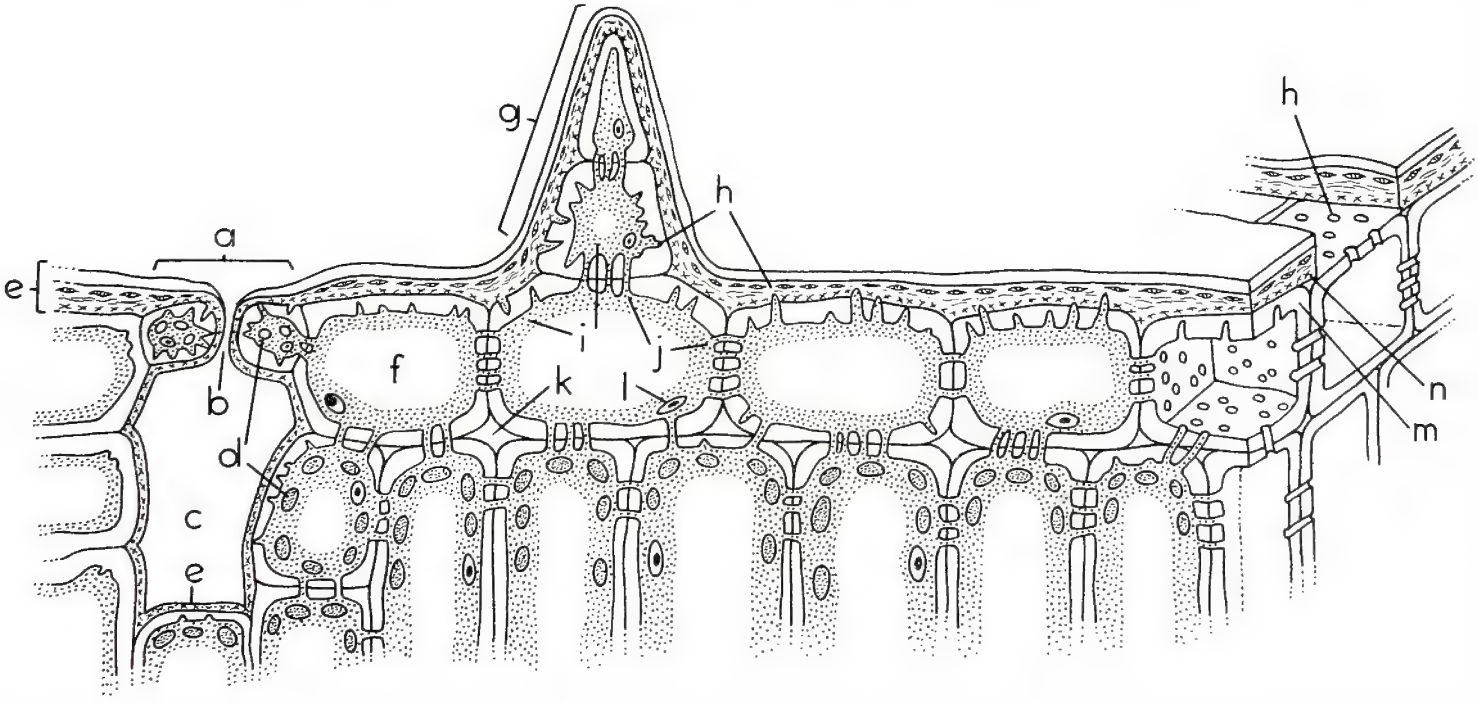


Fig. 3. George Abraham, generally known as "Doc," author of the popular weekly garden column, "The Green Thumb," which appears in many newspapers, is a strong advocate of foliar feeding. Here he is shown feeding some of the plants he grows in his commercial greenhouse at Naples, New York. With his wife Kate, he conducts a weekly garden program over WHAM radio, Rochester, New York.

waxy substance known as cutin (except for the stomatal openings) as was formerly believed. It is now known that both the upper and lower surfaces of leaves consist of intermittent parallel layers of pectin-like substances interspersed with the cutinized layers. (Fig. 1.) The pectinaceous substances have a great capacity for absorbing and releasing water and nutrients.

There is yet another means by which nutrients move in or out of cells. This is by the ectodesmata, small protoplasmic strands which penetrate epidermal cell walls and extend up into the cuticle. There are as many as seven thousand ectodesmata in a single plant cell. Thus, leaf surfaces are no longer considered to be relatively impervious to materials in solution.

Formerly it was thought that the lower leaf surface was more efficient in absorbing solutions because of the greater number of stomata (breathing pores) on that surface. This apparently is not the case, because the upper surface of some leaves can absorb as much phosphate as the lower surface, even though it has only one seventh as many stomata.

The potential absorbing surface of trees is indeed large. The leaf area of a twelve-year-old apple tree, for example, is about ten times the land area it occupies. And the ratio between leaf area of a shade tree growing along a city street and the constricted area it occupies is even greater.

This absorption of nutrients by leaves is generally greater during daylight hours. Other factors which favor absorption and transport of nutrients are vigorous growth, high humidity, temperature, incident radiation, and a carbohydrate supply. Chemical and physical properties of the nutrient spray itself, such as pH, carrier ions, and surface active agents, also exert a great influence.

Factors inherent in the leaves themselves affect nutrient intake. Among these are cuticle thickness, number of discontinuities (interspersed pectinaceous areas), hairiness or smoothness of leaf surface, and other properties influencing adherence. Young, rapidly expanding leaves absorb more nutrients per unit area than do fully mature ones. Generally speaking, the more vigorous the plant, the more nutrient it can absorb via the leaves. Not all plants, moreover, have the same capacity for absorbing nutrients through foliage sprays. Apple leaves, for example, can absorb more than peach leaves and bean leaves more than tomato leaves.

The most readily absorbed of the major elements is nitrogen applied in the form of urea. In fact, the entire nitrogen requirement of some crops can be satisfied by means of foliar sprays. Eighty per cent of the total nitrogen applied to the pineapple fields of Hawaii is foliar-absorbed from urea sprays. Then too, nitrogen in urea is quickly absorbed when applied to the leaves, slightly more than fifty per cent within one half to two hours of its application.

Sodium and potassium are two other elements readily absorbed by leaves, and they are among the most mobile once inside the leaves. Phosphorous, chlorine, sulfur, zinc, copper, manganese, iron, and molybdenum are respectively less mobile in the order given. The rate of movement of nutrients such as nitrogen, phosphorous, and potassium absorbed by leaves has been estimated at one inch in five minutes. While calcium is absorbed, it does not move out of the leaves. Despite this, calcium and its close relative magnesium can be applied successfully to the leaves of some plants to overcome a deficiency of these elements.

When and How to Apply Foliar Nutrients

Foliage-nutrient sprays should be applied either with a pressure sprayer (Fig. 2) or with one of the specially designed spray guns available at garden supply stores (Fig. 3). A sprinkling can may also be used, but this method is not as effective as spraying. The plants should be sprayed until the nutrient solution begins to drip heavily from the leaves.

There are now many brands of foliar spray materials on the market. These vary so much in their formulas that it is impossible to suggest dosages for each. Thus the manufacturer's specific directions must be carefully followed. Generally speaking, no more than the following amounts should be dissolved in each ten gallons of water used: five ounces of a 12-12-12, 13-13-13, or 13-26-13; four ounces of a 15-15-15, 15-30-15, or 16-16-16; three ounces of an 18-18-18, 20-20-20, or 23-19-17.

Gardeners are cautioned that not all fertilizers which are completely soluble in water can be safely sprayed on leaves. If a particular fertilizer can be used as a foliar spray, this is indicated clearly on the label.

Advantages of Foliar Feeding

There is no question as to the value of foliar nutrient sprays for the prevention or correction of minor element disorders. Deficiencies of secondary elements, such

as calcium and magnesium, can also be alleviated.

Nutrients applied to the leaves are absorbed and utilized at a far faster rate than those applied to the soil. In dry seasons, foliar sprays are particularly effective in maintaining good growth as the tree can start using the nutrients immediately. Non-liquid fertilizers placed in holes around a tree, on the other hand, are not absorbed by the tree roots in dry spells or in the cold spells of early spring. Moreover, trees growing in paved areas where open soil is limited can be fed through the leaves with excellent advantage.

Even plants which appear to be in good health may make more vigorous growth and put forth more numerous and larger blooms when fed frequently with foliar sprays. In recent tests at The New York Botanical Garden, three-year old 'Peace' roses were sprayed with a dilute solution of "Ra-pid-gro" at weekly intervals from late May to late September. Records on bloom-production and bloom-size were taken throughout the growing season. Bushes receiving the foliage feeding averaged 95.3 blooms as compared with 87 blooms for non-sprayed plants, an increase of more than nine per cent. Moreover, the blooms on treated plants were also generally larger. Finally, the "Ra-pid-gro" treated plants came through the following winter in as good or better shape than the controls, indicating that roses can be foliage-fed right to the end of the growing season without increasing their susceptibility to winter injury.

Insecticides and fungicides for control of pests and diseases can be combined with the nutrient spray, thereby saving time and effort, with little loss in effectiveness. Most of the nutrient concentrates which are safe to use on the foliage can be combined with the newer organic pesticides, such as ferbam, DDT, and malathion. The gardener can thereby feed his plants and control pests and diseases in a single operation. The rose garden at the United Nations in New York is sprayed many times each season with a combination of "Ra-pid-gro" and several pesticides including lindane, DDT, "Aramite", and "Phaltan." Other well-known rose gardens around the country are also sprayed with a combination of plant foods and pesticides.

Limitations of Foliar Feeding

It is well to stress that foliar feeding is a supplement to soil feeding and not a substitute for it. Although some plants have been grown to maturity on nutrients applied exclusively via the leaves, there are practical and economic reasons why many of the nutrients are best applied via the soil.

Occasionally, a report appears in the literature to the effect that foliar feeding is ineffective. There are several conditions under which nutrients are not absorbed, and these may explain the occasional poor results. The degree of hydration of the leaf surface at the time the nutrients are applied is most important. When leaves are distended, the guard cells swell and the stomata are open. Cuticular membranes also swell in the presence of moisture and become more permeable and absorbent for applied materials. High humidity and moisture on the external surface and low-moisture tensions within the plant all favor rapid foliar uptake.

Little or no visible results can be expected from a single application of plant food to the foliage, although its effect is traceable under controlled laboratory conditions. In most cases, it takes at least four applications to show improvement.

Crops grown in soils with adequate fertility do not respond to foliar sprays containing the three major elements nitrogen, phosphorous, and potassium. This is also true, however, for soil applications of fertilizer. In other words, response is most apt to occur where there is a definite shortage or unavailability of nutrients.

Foliar feeding, moreover, is not a cure-all for every garden ailment. Proper soil preparation and the conventional soil applications of fertilizers should be practiced. Mulching, watering, and other standard cultural practices will never become outmoded or replaced.

I conclude this discussion on foliar feeding in a fitting way by quoting part of the report made by Dr. S. H. Wittwer and his colleague at Michigan State University to the Atomic Energy Commission:

"The greatest value of nutritional spraying will likely be realized on crops where certain deficiency disorders can be easily corrected by spray treatments, where spraying is already an established practice, where total leaf areas are large, where conditions are not optimum for nutrient uptake by roots, and when there is a great demand for nutrients such as during flowering and early fruit set. These values are associated with leaf-feeding not as a replacement of soil fertilization but with its supplemental or booster effects. With few exceptions, it is feasible even with several applications to supply only a part, often a small part, of the total nutrient needs in crop production by nutritional sprays. The remainder must be absorbed by the roots."

Fig. 2. Some of the early, controlled experiments on foliar feeding of shade trees were conducted by The New York Botanical Garden in cooperation with the New York Department of Parks. Shown are Department of Parks employees and Joseph Kuc, assistant to Dr. Pirone in 1949. The trees being sprayed with "Ra-pid-gro" are elms and European lindens.

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Annual Meeting of the Corporation

May 2, 1966

All members of The New York Botanical Garden are cordially invited to attend the Annual Meeting of the Corporation at the Lorillard Snuff Mill at the Garden on Monday, May 2, 1966, at 2:30 p.m.

At this meeting, members of the Corporation, which is the parent body of the Garden, will elect members of the Board of Managers and will receive various reports on the Garden's activities. Distinguished Service Awards will also be presented at the meeting.

Formal notice of the meeting will be sent to all members of the Corporation, whose names appear below.

Mrs. Willcox B. Adsit
Arthur M. Anderson
Mrs. Montgomery B. Angell
Mrs. Harold E. Anthony
Elliott Averett
Mrs. Elliott Averett
Sherman Baldwin
Mrs. William Felton Barrett
Mrs. John D. Beals, Jr.
Mrs. Franklin B. Benkard
Mrs. Etienne Boegner
Mrs. Neville J. Booker
Mrs. James Cox Brady
Mrs. Richard De W. Brixey
Mrs. Detlev W. Bronk
Leonard J. Buck
Charles Burlingham
Mrs. Charles Burlingham
Mrs. F. Higginson Cabot
Mrs. Joseph Campbell
Mrs. LeRoy Clark
Dr. Harold H. Clum
Mrs. Leighton H. Coleman
Mrs. Henry S. Fenimore Cooper
Mrs. Erastus Corning II
Mrs. William Redmond Cross
C. Suydam Cutting
Mrs. Sidney G. de Kay
Edward C. Delafield
Mrs. Edward C. Delafield
Mrs. Lyman Delano
Hon. Thomas C. Desmond
Mrs. Fairman R. Dick
Mrs. Charles Doscher
Mrs. Percy L. Douglas
Henry F. du Pont
Mrs. Walter K. Earle
Mrs. William B. Eddison
Mrs. Robert B. English
Harold Epstein
Mrs. Marcus Fair
Mrs. B. Tappen Fairchild
Dr. John M. Fogg, Jr.
Mrs. Mortimer J. Fox
Mrs. Edward W. Freeman
Mrs. John W. Galbreath
Mrs. John Gerdes
Dr. H. A. Gleason
Mrs. L. Whittington Gorham
Mrs. William H. Gregory
Mrs. Raymond M. Gunnison
Mrs. Henry B. Guthrie
Mrs. Sherman P. Haight
Charles B. Harding
Mrs. Randolph C. Harrison
William E. Hutton
Mrs. J. Horton Ijams
Mrs. John N. Irwin 2nd
Mrs. Edwin C. Jameson
Mrs. Alvin R. Jennings
Rodney Wilcox Jones
Prof. Marshall Kay
Dr. Theodore Kazimiroff
Mrs. William Kemble
Mrs. Francis K. Kernan
Dr. Charles G. King
Mrs. Warren Kinney
Mrs. Grayson Kirk
Dr. Samuel W. Lambert, Jr.
Mrs. Samuel W. Lambert, Jr.
Mrs. Blake L. Lawrence
Mrs. Madison H. Lewis
Mrs. John E. Lockwood
Mrs. Albert P. Loening
Judge Charles A. Loreto
Mrs. Robert A. Lovett
Mrs. Ethelbert Ide Low
Mrs. Donald Lowe
Mrs. James C. Mackenzie
Mrs. Peter Malevsky-Malevitch
Mrs. Clifford D. Mallory
Alastair Martin
Prof. Edwin B. Matzke
Mrs. Huntington McLane
Mrs. Constance M. Meredith
Miss Elinor Merrell
Mrs. Elmer D. Merrill
Mrs. Clarence G. Michalis
S. P. Miller
Mrs. Harold Ruckman Mixsell
Henry de la Montagne
Mrs. Roger G. Mook
Barrington Moore
B. Y. Morrison
Frederick S. Moseley, Jr.
Rev. Vincent T. O'Keefe, S. J.
Mrs. Augustus G. Paine
Henry Parish II
Mrs. John E. Parsons
Mrs. Harry T. Peters
Mrs. Thomas McC. Peters
Howard Phipps
Mrs. H. Harvey Pike
Mrs. Hermann G. Place
Rutherford Platt
Prof. Frank J. Pokorny
Mrs. Harold I. Pratt
Mrs. Charles G. Proffitt
Lady Ramsey
Mrs. S. Bulkley Randolph
Michael Rapuano
Johnston L. Redmond
Mrs. Fergus Reid, Jr.
Mrs. Volney F. Righter
Mrs. David C. Rockefeller
Mrs. George Emlen Roosevelt
Mrs. Herman D. Ruhm, Jr.
Mrs. Melvin E. Sawin
John M. Schiff
Mrs. Henry F. Schwarz
Mrs. Townsend Scudder
Mrs. John L. Senior
Dale E. Sharp
Mrs. Guthrie Shaw
Langdon S. Simons
Mrs. Langdon S. Simons
Mrs. John C. Sluder
Mrs. Clarance Stanley
Dr. William C. Steere
Mrs. Eugene W. Stetson
Chauncey Stillman
Mrs. Byron Stookey
Mrs. Donald B. Straus
Mrs. Paul Sturtevant
Mrs. Arthur H. Sulzberger
Mrs. Cochran B. Supplee
Mrs. Thomas D. Thacher
Oakleigh L. Thorne
Mrs. Ernest B. Tracy
John C. Traphagen
Mrs. Ernest G. Vietor
Mrs. Oliver A. Vietor
R. Gordon Wasson
Mrs. Charles D. Webster
Mrs. Arnold Whitridge
Mrs. Wallace S. Whittaker
Mrs. Earl K. Williams
Mrs. John G. Winchester
Dr. John C. Wister

COURSES, LECTURES AND OTHER GARDEN EVENTS

(For detailed information about a particular event or course, write or phone LU 4-8500)

CHILDREN'S OUTDOOR GARDENCRAFT (spring and summer 1966). Saturday classes, 9:30 a.m.-12 noon, continue until end of school year, then two week-day mornings through summer. Instructors—Lillian Weber, Nancy Callaghan, Hetty Everett, Agnes Faithorn, Robert Russo.

SPRING SHOW IN THE CONSERVATORY—Continues until March 20, 1966.

"IRELAND'S COUNTRYSIDE AND PEOPLE," illustrated Saturday Afternoon Lecture by Mrs. Anne Neylon on March 12, 1966, at 3:15 p.m., Auditorium of the Museum Building. Preceded by a half hour of recorded music.

"WILD FLOWERS IN WYOMING'S MOUNTAINS," illustrated Saturday Afternoon Lecture by Mr. and Mrs. A. Clayton Scribner on March 19, 1966, at 3:15 p.m., Auditorium of the Museum Building. Preceded by a half hour of recorded music.

HOW TO GROW, SHOW, AND JUDGE ROSES (three weekly sessions)—Wednesday evening class, 8-9:30 p.m. Starts March 23, 1966. Museum Building. Instructor—Edward J. O'Keefe.

"THE A B C'S OF THE ART OF BONSAI," illustrated Saturday Afternoon Lecture and demonstration by Yuji Yoshimura on March 26, 1966, at 3:15 p.m., Auditorium of the Museum Building. Preceded by a half hour of recorded music.

HOW TO PRUNE (three weekly sessions)—Monday afternoon class, 1:45-3:15 p.m.; evening class, 8-9:30 p.m. Starts March 28, 1966. Museum Building. Instructor—T. H. Everett.

ELEMENTARY BONSAI (three weekly sessions)—Tuesday morning class, 10 a.m.-12 noon; evening class, 8-10 p.m. Starts March 29, 1966. Museum Building. Instructor—Yuji Yoshimura.

MEMBERS' EVENING, March 31, 1966, 8:30 p.m., at Biltmore Hotel, New York, N.Y.

ELEMENTARY BONSAI (three weekly sessions)—Friday morning class, 10 a.m.-12 noon; evening class, 8-10 p.m. Starts April 1, 1966. Museum Building. Instructor—Yuji Yoshimura.

EASTER SHOW IN THE CONSERVATORY—April 3-18, 1966.

TREES AND SHRUBS IN SPRING (8 weekly sessions)—Saturday morning class, 10 a.m.-12 noon. Starts April 2, 1966. Museum Building. Instructor—Eleanor Yarrow.

"YOU CAN GROW ORCHIDS IN YOUR HOME," illustrated Saturday Afternoon Lecture by Harold Epstein, on April 2, 1966, at 3:15 p.m. Auditorium of the Museum Building. Preceded by a half hour of recorded music.

LANDSCAPE GARDENING (7 weekly sessions)—Tuesday evening class, 8-10 p.m. Starts April 5, 1966. Museum Building. Instructor—Arthur F. Murphy.

FLOWER AND LANDSCAPE PAINTING (8 weekly sessions)—Tuesday morning class, 9:45 a.m.-12:30 p.m. Starts April 5, 1966. Museum Building. Instructor—Edgar A. Whitney, A.W.S.

GARDENING PRACTICE I (8 weekly sessions)—Thursday morning class 10-11:45 a.m.; evening 8-9:45 p.m. Starts April 7, 1966. Museum Building. Instructors—James M. Gibb and Robert Russo.

LANDSCAPE GARDENING (7 weekly sessions)—Thursday evening class, 8-10 p.m. Starts April 7, 1966. Museum Building. Instructor—Arthur F. Murphy.

FLOWER AND LANDSCAPE PAINTING (8 weekly sessions)—Friday morning class, 9:45 a.m.-12:30 p.m. Starts April 8, 1966. Museum Building. Instructor—Edgar A. Whitney, A.W.S.

"ART FORMS IN NATIVE TREES," illustrated Saturday Afternoon Lecture by Warren Cooper, on April 9, 1966, at 3:15 p.m. Auditorium of the Museum Building. Preceded by a half hour of recorded music.

BOTANY FOR BEGINNERS (8 weekly sessions)—Wednesday morning class, 10 a.m.-12:00 noon; evening class 8-10 p.m. Museum Building. Starts April 13, 1966. Instructor—Eleanor Yarrow.

"GLIMPSES OF PLANTS AND GARDENS IN FOREIGN LANDS," illustrated Saturday Afternoon Lecture by Mr. and Mrs. Henry Downer, on April 16, 1966, at 3:15 p.m. Auditorium of the Museum Building. Preceded by a half hour of recorded music.

INTERMEDIATE AND ADVANCED BONSAI (6 weekly sessions)—Tuesday morning class, 10 a.m.-12 noon; evening class, 8-10 p.m. Museum Building. Starts April 19, 1966. Instructor—Yuji Yoshimura.

GARDENING WITH WILD FLOWERS (6 weekly sessions)—Wednesday morning class, 10 a.m.-12 noon. Starts April 20, 1966. Museum Building. Instructor—Dr. Lucille K. Blum.

INTERMEDIATE AND ADVANCED BONSAI (6 weekly sessions)—Friday morning class, 10 a.m.-12 noon; evening class, 8-10 p.m. Starts April 22, 1966. Museum Building. Instructor—Yuji Yoshimura.

"GROWING ROSES IS FUN," illustrated Saturday Afternoon Lecture by Edward J. O'Keefe on April 23, 1966, at 3:15 p.m. Auditorium of the Museum Building. Preceded by a half hour of recorded music.

"HERB GARDENS OF THE HUDSON RIVER VALLEY," illustrated Saturday Afternoon Lecture by Mr. and Mrs. William R. Epes, on April 30, 1966, at 3:15 p.m. Auditorium of the Museum Building. Preceded by a half hour of recorded music.

"OUR TROPICAL NATIONAL PARK—St. John," illustrated Saturday Afternoon Lecture by Ruth H. Smiley on May 7, 1966, at 3:15 p.m. Auditorium of the Museum Building. Preceded by a half hour of recorded music.

FIELD BOTANY (8 weekly sessions)—Monday morning class, 10-11:45 a.m.; evening class, 7-8:45 p.m. Starts May 9, 1966. Museum Building. Instructor—Eleanor Yarrow.

"JOHN BURROUGH'S NOTES ON FLOWERS," illustrated Saturday Afternoon Lecture by Elizabeth Burroughs Kelley, on May 14, 1966, at 3:15 p.m. Auditorium of the Museum Building. Preceded by a half hour of recorded music.

"BIBLE LANDS," illustrated Saturday Afternoon Lecture by Gertrude H. Helbling, on May 21, 1966, at 3:15 p.m. Auditorium of the Museum Building. Preceded by a half hour of recorded music.

GRADUATION RECEPTION for students of the Two-Year Courses in Botany, Practical Gardening, and Landscape Gardening on June 7, 1966, at 8 p.m. Auditorium of the Museum Building.

Admission to Saturday Afternoon Lectures, 25 cents, free to members of the Garden (upon presentation of membership card).

Nature Walks, fee $1.00 per person.

For fees of the various courses, see the Educational Program.

NEWS, NOTES and COMMENTS

The Professional Horticultural Exploration of England and Scotland, sponsored by The New York Botanical Garden, with T. H. Everett, Assistant Director (Horticulture) and Senior Curator of Education, the tour leader, offers opportunity for professional horticulturists to participate in a horticultural travel adventure.

Trillium grandiflorum.

Aquilegia canadensis.

Sanguinaria canadensis.

Those participating in the tour, June 9-30, 1966, will meet the directors, principals, and staff of some of the leading British horticultural institutions, botanical gardens, parks, schools, universities, nurseries, and estates.

Tour rates are: double room $976 per person, single room, where available, $1,056 per person. A deposit of $200 is required with each registration, the balance payable before April 20, 1966. Complete details may be had from Floral and Travel Ltd., 730 Fifth Avenue, New York 10009.

Wild Flower Notes. The Native Plant Garden Committee of The New York Botanical Garden has published attractive Wild Flower Notes; two each of three designs make up a box of six. The designs, representing *Aquilegia canadensis, Sanguinaria canadensis,* and *Trillium grandiflorum,* are by the artist Natalie C. Davis who is illustrating for the Native Plant Garden Committee. Miss Davis was staff artist for the Department of Botany, University of Illinois, for fourteen years and previously a member of the staff of the Academy of Fine Arts in Philadelphia.

The Wild Flower Notes are obtainable at $1.00 per box from The Native Plant Garden Committee of The New York Botanical Garden, 125 East 65th Street, New York, N. Y. 10021, or in the Conservatory at the Garden.

Dr. Herman F. Becker, Curator of Paleobotany, has an article on "Rare Fossil Insects from Montana" in *Animals,* an English publication, in the December, 1965, number. He attended the meetings of the American Association for the Advancement of Science, held at Berkeley, California, December 26-31, 1965, especially those lectures devoted to paleobotanical subjects. While there, he examined western Tertiary floras in the Paleontology Division of the University of California. During the next two years, 1966 and 1967, Dr. Becker will study western Tertiary floras under a grant from the National Science Foundation awarded to the Garden for this purpose.

Dr. Marjorie Anchel, Senior Research Associate, and Dr. Trevor C. McMorris, Research Associate, attended the National Products Symposium, sponsored by the Chemical Department of the University of the West Indies at Kingston, Jamaica, January 4-8, 1966.

John Reed, Curator of the Library, has been busily engaged the past two months in moving the book collection into the Harriet Barnes Pratt Library Wing. Preliminary work began on December 21, 1965, the full-fledged move began at nine o'clock on the morning of January 4, 1966, and the entire collection is now in the new quarters. In the process of moving, Mr. Reed and assistants shelf-read the entire library, restoring it to proper order and also undertook cleaning the books from dust and grime accumulated for many years.

Phil Clark, Assistant to the Director (Public Relations) and Membership Chairmen of the Garden, who directed the very successful New York Botanical Garden Tour of Guatemala in October, 1965, will conduct another tour in October, 1966, this time in association with the Jean Berke Travel Service.

The tour will include gardens and wild flowers, historical, archaeological, and Indian scenic areas and will be scheduled for two weeks.

Visits will be made to outstanding private homes and country estates through special arrangements made by Mr. Clark, who was for ten years a resident of Mexico and a frequent traveler in Guatemala. He is the author of *A Guide to Mexican Flora.*

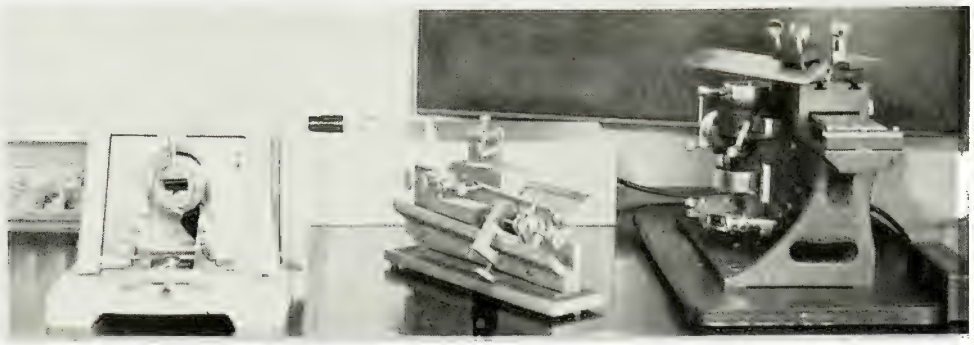
Transportation within Guatemala will be by limousines chauffered by English-speaking Guatemalan guides. Mr. Clark will act as botanical and gardening specialist.

Further information may be obtained by writing Mr. Clark at The New York Botanical Garden, Bronx, N. Y. 10458.

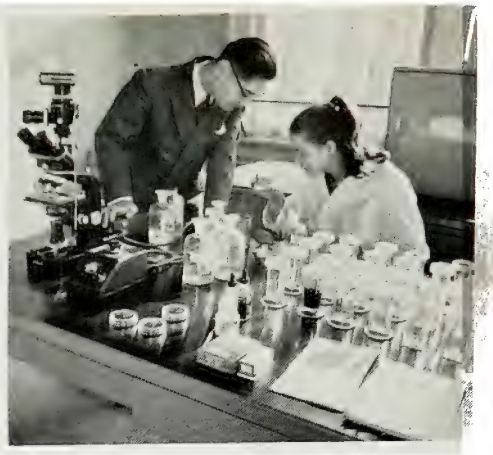
Susan Carey (Mrs. John R.) Canham received her doctorate in botany from Columbia University on December 3, 1965. The subject of her thesis—"Studies in the genus *Hypocrea* (Fungi, Hypocreales, Ascomycetes)." Mrs. Canham studied in the Cryptogamic Herbarium under Dr. Clark T. Rogerson; she held a graduate student fellowship in the Phanerogamic Herbarium and was a graduate research assistant under Dr. Rogerson's grant from the National Science Foundation. Presently, Mrs. Canham is a postdoctoral fellow under Dr. Anchel's grant from the National Institutes of Health.

Anniversary Gifts were presented by Dr. William C. Steere to Patrick Leonard of the Gardening Department for twenty-five years of service, to Roland Wills, engineer, for twenty-five years of service, and to Lillian Weber, Instructor in the

Dr. William C. Steere, Director, presents an anniversary gift to Roland Wills for twenty-five years of service to the Garden.



Above. A modern model of sliding microtome (right) replaces a fifty-year old model (center). The sliding microtome sections hard material, while the rotory microtome (left) is for soft material embedded in paraffin.



Right. Dr. T. Koyama, Associate Curator, inspects sections of sedge leaves prepared and stained by Gaile F. Clements, Research Assistant in the micromorphology laboratory.

Educational Department, for forty years of service at the annual Christmas party given by the President and the Board of Managers to the Garden's employees.

Dr. Steere also presented retirement gifts to Alfred G. Huber, Charles Czarnecki, John Whitford, and Louis Sacco.

A Micromorphology Laboratory has recently been established in the Herbarium largely from a National Science Foundation grant to The New York Botanical Garden. The laboratory is designed and equipped to carry out anatomical, cytological, and palynological studies in connection with major taxonomic research projects. Two cytological microscopes, one with a newly improved photomicrography apparatus and a phase contrast attachment with two different series of phase objective lenses, have been acquired. Among other new equipment are a stereoscopic microscope with a macrophotography apparatus, a centrifuge for pollen studies, two microtomes for both cytology and anatomy, and also standard embedding and staining equipment.

Under the supervision of Dr. Tetsuo Koyama, Associate Curator, this laboratory is currently furnishing various data for Dr. Maguire's projects on Neotropical taxonomy and Dr. Koyama's monograph of the *Cyperaceae*.

Recent investigations in plant taxonomy have demonstrated the value of micromorphological characters, such as tissues, chromosomes, and pollen grains, in supplementing gross morphological characters, so that taxonomic studies may be brought to more reasonable and more convincing conclusions. Dr. Koyama hopes that this laboratory will eventually expand in set-up and staff in order to be of sufficient magnitude to undertake all the laboratory operations required by the Botanical Garden's taxonomic activities.

Dr. Steere extends best wishes to Alfred G. Huber upon his retirement from the Garden.

Staff Seminars. On January 20, 1966, Phil Clark, Assistant to the Director (Public Relations) spoke before the staff and students on the Garden's "Guatemalan Tour," and on February 1, Dr. Lyman B. Smith, Senior Scientist of the Smithsonian Institution, addressed the staff and students on "Vegetation Zones in Southern Brazil." Dr. Arthur Cronquist, Senior Curator, is responsible for the seminars.

Dr. Lyndon O. Brown, of Bronxville, New York, a member of the Board of Managers since October, 1959, and Chairman of the Public Relations Committee, of The New York Botanical Garden died January 23, 1966, at the age of sixty-three. The study shrub collection, a new addition to the Garden in 1965, was made possible through Dr. Brown's generous gift of funds.

Dr. Brown was Chairman of the Executive Committee and Senior Vice President of Dancer-Fitzgerald-Sample Inc. He joined this advertising agency after he had held the office of President of Knox College, Galesburg, Illinois.

Visitors to the Garden. During December, 1965, Dr. F. Schaarschmidt, paleobotanist, and Dr. H. F. Conert, taxonomist, of the Senckenberg Museum, Frankfurt am Main, Germany, conferred with Dr. Herman F. Becker; also Dr. Walter Hodge of the National Science Foundation, Dr. Seymour Shapiro, Dr. R. M. Schuster, and Dr. Oswald Teppo, all of the University of Massachusetts.

Dr. Lyman B. Smith and Dr. T. Soderstrom, Smithsonian Institution, Washington, D. C.

Dr. Richard Howard and S. S. Sween, Arnold Arboretum, Jamaica Plain, Mass.

Dr. C. E. Wood, Arnold Arboretum, Cambridge, Mass.

Dr. John J. Wurdack, U. S. National Museum, Washington, D. C.

Dr. William J. Cody, Plant Research Institute, Ottawa, Canada.

Dr. A. Goldberg, U. S. Department of Agriculture, Washington, D. C.

Dr. P. C. Baker and Dr. T. R. Bradley, University of North Carolina, Chapel Hill.

Dr. F. R. Fosberg, U. S. Geological Survey, Washington, D. C.

Dr. John Stevenson and Dr. Carl Withner, Brooklyn College, Brooklyn, N. Y.

Dr. George Gillett, University of Hawaii, Honolulu.

Dr. Eric Meyer and Anne Salvato, University of Georgia, Athens.

Dr. Carl D. Clayberg, Connecticut Agricultural Experiment Station, New Haven.

Dr. Leo J. Hickey, Department of Geology, Princeton University, Princeton, N. J.

Dr. Edward Browne, University of Kentucky, Lexington.

Dr. Jan A. deBruyn, Department of Botany, University of Stellenbosch, South Africa.

John Brimer, Macmillan Company, New York, N. Y.

Dr. Sanford Siegel, William J. Schneider, and Robert Klam, Union Carbide, Tarrytown, New York.

Dr. Harold William Rickett, the Garden's Senior Curator of Botany, photographs wild flowers near his home in Roxbury, Connecticut. He reports that Volume I of the Wild Flower Series is on the presses, the text of Volume II is being written, the illustrations are being selected for Volume III, and the preliminary list is being prepared for Volume IV.

High Rock Nature Conservation Center was acquired in May, 1965, by the City of New York, with funds provided by the City and the State of New York. In making funds available, the State specified that this area, located in the center of Staten Island, will be retained for nature study and to conserve it as as natural resource. This Conservation Center, which is under the jurisdiction of the Department of Parks, is operated by the Staten Island Institute of Arts and Sciences with the cooperation of the Community Council of Greater New York. It will be maintained in its natural state. Initially, only necessary trails, to be marked with items of botanical interest, will be developed. It is planned also to introduce rare and unusual plants for study and demonstration, and for the encouragement of bird life.

Recently the Men's Garden Club helped in transplanting shrubs saved from the Richmond Parkway site, and District 1 of the Federated Garden Clubs of New York State, Inc., has offered to furnish plants and labels for an additional nature trail, when new trails are decided upon.

The State Island Institute of Arts and Sciences has submitted plans for continuing the nature conservation education for school children. Funds are needed for this program, and contributions may be sent to Staten Island Institute of Arts and Sciences, 75 Stuyvesant Place, Staten Island, New York 10301.

United States National Arboretum has instituted a pilot program for the training of Washington, D. C., high school students in horticulture under an agreement with the Phelps Vocational High School. A certain number of hours of work each week will be provided for the students in the research greenhouses and on the grounds, so they may learn techniques in propagating and caring for plants, and in handling equipment.

New Rose Garden at the National Arboretum. During the annual meeting of the American Rose Society, held in Washington, D. C., in fall 1965, its president, Dr. Robert M. Zollinger of Columbus, Ohio, broke ground for the new rose garden at the United States National Arboretum. Dr. Francis De Vos, the Arboretum's Assistant Director, witnessed the ceremony.

Wilbur E. Wright has been appointed Director of the State Park Division of the New York Department of Conservation, filling the position vacant since the death of Leonard Huttleston. Mr. Wright, who had been Director of the Rochester Park System and more recently head of the Monroe County (New York) Park Department, was a student gardener at The New York Botanical Garden in the early 1940's.

Memorial to Ira S. Nelson. The Louisiana Society for Horticultural Research, by action of its Board of Trustees, has authorized the "Ike Nelson Memorial Fund." He was one of the founding fathers of the Society and gave unselfishly of his time and effort to its advancement. Contributions to the Memorial Fund may be directed to Earl E. Vallot, Youngsville, La. 70592.

Dr. Joel L. Fletcher, President of the University of Southwestern Louisiana, said Professor Nelson "was one of the all-time greats among Southwestern faculty members. In his quiet, gentle way, he won for the department [of horticulture] not only statewide recognition, but worldwide. He was a loyal, wonderful teacher. . ."

Tribute to John C. Wister. The Royal Horticultural Society of Great Britain dedicated its 1966 *Yearbook* to Dr. John C. Wister, Director of the Arthur Hoyt Scott Foundation at Swarthmore College and of the John J. Tyler Arboretum in Lima. This is the first time in the Society's seventy-seven-year history an American has been so honored.

At the beginning of the *Yearbook*, H. J. Randall, Past President of the British Iris Society, described Dr. Wister as "one of the most experienced and best loved of American horticulturists. He is keenly interested in everything he grows. He has become a recognized and worldwide authority on many genera, but I have not yet discovered which genus pleases him most. All I know is that whether I talk to him of daffodils, irises, peonies, rhododendrons, roses, lilacs, magnolias, hemerocallis, or the rest, I have the feeling that I am talking to a walking encyclopedia with a boundless enthusiasm.

"John Wister has received honors and awards for his work as writer, lecturer, advisor, and, I like to think, for his great kindness in sharing his treasures with other people."

Robert Russo, the Garden's Foreman of Greenhouses, holds the bucket orchid, *Coryanthes (affinitas) macrantha*, which flowered this past winter. It is an offspring of the plant that was collected in 1955 at Ayanganna, British Guiana, by Dr. Bassett Maguire, the Garden's Head Curator. (See *The Garden Journal* 8: 1, 34, 35.)

Frederic Heutte, who retired recently as Director of the Norfolk Botanical Garden, is now Director of Plant Research and consultant on urban and civic beautification of Winn Nursery, Inc., of Norfolk, Virginia. His responsibility is to ferret out plants best suitable for the area and to complement or replace time-tested species and varieties for the average home garden. It has long been Mr. Heutte's ambition to experiment with plants which might stand salt invasions or be suitable for elevations a foot or so above normal tides. He believes there must be other plants which would grow as well as the groundsel tree along salt marshes as it does on high land. It was by accident Mr. Heutte discovered that in his own salt-marsh, where he dumps all grass clippings and organic materials, *Hydrangea hortensis, Pittosporum tobira, Ilex vomitoria, Hemerocallis, Narcissus,* and others not only survive but thrive at an elevation just a foot above normal tides. (This means one salt tide invasion a month.)

Mr. Heutte was presented with the annual professional award in horticulture by the Horticultural Society of New York at it annual meeting, which was held at the Essex House on January 19, 1966.

The citation for distinguished service to horticulture by an organization was awarded to Planting Fields Arboretum at Oyster Bay, Long Island: "In addition to its great horticultural collection of specimen trees and shrubs, azaleas and rhododendrons, Planting Fields has made its contemporary contribution to horticulture by the design and establishment of the first 'synoptic' area. . . ."

The citation for distinguished service to horticulture by an amateur was awarded to Mrs. Paul Mellon "an early disciple of Frederick Law Olmsted. At the request of the late President Kennedy, Mrs. Mellon redesigned the rose garden on the White House Grounds and has assisted the White House in many other horticultural matters. As a command performance for Mrs. Lyndon B. Johnson, she redesigned the White House East Garden, perhaps her most inspired creation, now renamed the Jacqueline Kennedy Garden. At present, Mrs. Mellon serves on a committee to assist with an improved landscape design for Lafayette Park opposite the White House."

A special citation for distinguished service to horticulture was presented to Richard B. Farnham, the Society's Executive Secretary for the past sixteen years, "through whose efforts as teacher, inspired leader, and advisor to many in all phases of horticulture, the Horticultural Society of New York has flourished and immeasurably increased its stature. . . "

Tenth Annual House and Garden Tour for the benefit of the Institute of Physical Medicine and Rehabilitation of the New York University Medical Center will be held May 19, 1966, in Westchester County, New York. Proceeds from the tour will be allocated to the construction of an auxiliary pavilion in which the young patients "Leisure Lounge" will be housed. The Lounge will be used for continued therapy, and in off-treatment hours will provide recreational activities for teen-agers.

Further information may be had from New York University Office of Information Services, Medical Center, New York, New York 10016.

Fifth Annual International Flower Show is scheduled for May 16-21, 1966, 10 a.m.-5:25 p.m. daily except May 19, 12:05 p.m.-9 p.m. More than two hundred and fifty thousand cut-flowers, shrubs, and trees from all parts of the world will be displayed on the first floor of Hess's Department Store, Allentown, Pennsylvania. Artistic arrangements using plants from these areas will highlight the West Indies, the Far East, and countries in Europe and Africa. Many of the arrangements are exhibited with Hess's collection of priceless antiques and objects of art.

All-American Selections has flower trial gardens at twenty-six testing locations and has twenty other demonstration gardens across Canada and the United States to Mexico. There also are twenty-six vegetable trial grounds for testing new vegetable varieties in comparison with their most competitive varieties in commerce.

Penn State University, University of Illinois, Virginia Polytechnic, Rutgers–The State University, and University of Massachusetts at Waltham hold annual field days, when thousands of visitors come by car, bus, train, and plane to see the plants growing under trial and to select those they want for their own gardens.

Others visit Callaway Gardens at Pine Mountain, Georgia, Whitnall Park near Milwaukee, Kingwood Center at Mansfield, Ohio, Longwood Gardens at Kennett Square, Pennsylvania, Central Experiment Station at Ottawa, Ontario, Royal Botanical Gardens at Hamilton, Ontario, Toronto's Edwards Park, Montreal Botanical Garden, Los Angeles State and County Arboretum, Norfolk Botanical Garden, to mention a few of the parks, gardens, and arboretums which have demonstration gardens of All-Americas Selections.

Young America Gardens Contest for 1966 is again being sponsored by the Flower and Garden Foundation, Box 3357, Rosedale Station, Kansas City, Kansas 66103. Contestants are expected to develop a two-hundred-square-foot garden all in one plot or in several, to write a short article about the garden after it has reached maturity, and to submit a snapshot of themselves in the garden.

Contestants should send name, age, address, and name of adult sponsor, and twenty-five cents to the Foundation at the above address. Final date of entry in the contest is May 15, 1966.

Third World Congress in Public Park and Recreation Administration will be held in the County Borough of Brighton, England, May 15-28, 1967. The Congress will be held in three parts: the first will include presentation of papers, inspection of parks and recreation centers, and an exhibition of plans, photographs, and mechanical equipment. The second part will consist of a visit to the Chelsea Show, and the third a tour of Scotland. Details may be obtained from K. L. Morgan, Secretary, Institute of Park and Recreation Administration, Lower Baseldon, Reading, Berks.

King's Park Botanic Garden was officially opened in October, 1965, by the Hon. David Brand, M.L.A., Premier of Western Australia. The Park itself, a tract of almost one thousand acres of state land in the metropolitan area of Perth, was reserved for park purposes in 1872.

After action by the Royal Society of Western Australia in 1957, the state government appointed a committee to examine many areas, and the committee recommended a site in King's Park. A year later Dr. W. S. Stewart, Director of the Los Angeles State and County Arboretum, California, visited Perth and at the government's request prepared a report and recommendation upon the site in King's Park. In 1961, Dr. J. S. Beard was appointed the Director of the new botanic garden.

At present King's Park Botanic Garden is staffed by the Director and horticultural personnel. Their activities are concerned with conservation of local and rare species which are threatened with extinction by land development and the establishment of such plants in cultivation and their propagation; with observations which will contribute toward a biological Flora of Western Australia; and with seed distribution. 3,393 packets of seed were distributed free to botanical institutions and 7,709 sold to private individuals in the year ending June 30, 1965.

A three-year course for students in horticulture and park administration has been initiated by the Department of Education.

The twenty-ninth Maryland House and Garden Pilgrimage will be held April 28-May 8, 1966. It is sponsored by the Federated Garden Clubs of Maryland and several historical and art organizations. Tour books, with information on places to be visited, may be obtained by addressing the Pilgrimage at Room 223, Sheraton-Belvedere Hotel, Baltimore, Maryland 21202.

"The World in Your Garden," the twentieth Williamsburg Garden Symposium, will open March 20, 1966. It is sponsored by Colonial Williamsburg and American Horticultural Society. Among those participating in the five-day program are Mrs. Jeanne Holgate, artist to the Royal Horticultural Society, and Meihof Kasuya, founder of the Ichiyo School of Floral Art in Tokyo.

Other speakers include George H. M. Lawrence, Director of the Rachel McMasters Miller Hunt Botanical Library; John L. Creech, Chief, New Crops Research Branch, United States Department of Agriculture; and Richard W. Lighty, geneticist of Longwood Garden. George B. Hartzog, Jr., Director of National Park Service, will speak on America the Beautiful at the closing session on March 25.

Details may be obtained from Mary B. Deppe, Registrar, Goodwin Building, Williamsburg, Virginia 23185.

Fifth Annual Clara B. Ford Garden Forum will be held at the Henry Ford Museum and Greenfield Village in Dearborn, Michigan, May 19-21, 1966.

Euonymus fortunei **'Longwood'** has been released by the United States Department of Agriculture to plant breeders and nurserymen for propagation. It is well adapted as a low ground cover, especially in shady or partially shady areas, or as a cover on low masonry walls.

This selection originated from a plant collected on Mt. Tsukuba in Japan by Dr. John L. Creech of the U.S.D.A. Agricultural Research Service. The name 'Longwood' is in recognition of Longwood Gardens' support of ornamental plant explorations.

Old Apple Varieties. If interested in old apple varieties, write to the Worcester County Horticultural Society, 30 Elm Street, Worcester, Mass., for the list of available varieties which can be grown in limited areas by using semidwarf trees.

BRIEF NOTES ON RECENT BOOKS

TREES AND SHRUBS

GARDEN OF TREES AND SHRUBS. Lape, Fred. 129 pages, illustrated, indexed, appendices. Cornell University Press. Ithaca, New York. 1965. $7.50.

Chapter 7, "Conifers Worth Planting," of this book was published in the November-December, 1965, issue of *The Garden Journal*, and each of the other thirteen chapters, ranging from "First Steps: What to Do and What Not to Do" through "Records, Maps, and Labels" to "School Arboretums and School Forests" and "The Later Years of an Arboretum" furnishes equally valuable information, indispensable for the library of an established arboretum or for any group or institution about to embark on setting up an arboretum.

TREES FOR AMERICAN GARDENS. Wyman, Donald. 376 pages, illustrated, indexed. The Macmillan Company, New York. 1965. $9.95.

Dr. Wyman has considerably revised this book, which was first published in 1951, updating the information and adding more than three hundred kinds. The list of recommended trees, 745 species and

varieties, covering height, flower, fruit, foliage, habitat, growth requirements and use; the secondary list of 1,600 species and varieties no better than or inferior to those on the recommended list; the practical cultural directions, general background facts, and so forth combine to make this book a valuable guide for the amateur gardener, the professional horticulturist, and landscapist.

CONE-BEARING TREES OF THE PACIFIC COAST. Bowers, N. A. 169 pages, illustrated, indexed. Pacific Books, Palo Alto, Calif. 1965. $4.95.

The seventh edition of this book includes new material on the bristle cone pine, resulting from a study at the Laboratory of Tree-Ring Research, University of Arizona, under grants from the National Science Foundation.

THE GUIDE TO GARDEN SHRUBS AND TREES. Taylor, Norman. 450 pages, illustrated (part color), indexed. Houghton-Mifflin Co., Boston. 1965. $6.95.

In his latest book, Norman Taylor answers three questions of importance to the home gardener: "What is that shrub or tree?" "How do I grow it?" "What can I use it for?" He describes in easily understood language and gives brief cultural notes on five hundred species and varieties of trees and shrubs, including woody vines.

Three hundred and twenty-one of the subjects under discussion have been illustrated in color, one hundred and seventy-seven in black and white by one of America's leading botanical artists, Eduardo Salgado.

MISCELLANY

MANUAL OF CANE-GROWING. King, Norman J., R. W. Mungomery, and C. G. Hughes. 375 pages, illustrated, indexed. American Elsevier Publishing Co., New York. 1965. $11.00.

This revised edition of the manual that was first published in 1953 incorporates up-to-date information on all phases of cane growing. The three authors are members of the staff of the Bureau of Sugar Experiment Stations in Queensland, Australia, which is recognized as second to none in the world for research on sugar.

HERBAL. Krutch, Joseph Wood. 255 pages, illustrated, indexed, bibliography. G. P. Putnam's Sons, New York. 1965. $20.00.

In this unique book, Joseph Wood Krutch, talented naturalist-writer, has successfully reproduced beautiful woodcuts of one hundred plants and six creatures from Mattioli's *Commentaries on the Six Books of Dioscorides*, issued in Prague in 1563 and in Venice in 1565.

A delightful commentary, with appropriate quotations from old herbalists and others, appears on the page facing each illustration.

NATIONAL PARKS OF THE WEST. Sunset Book and Sunset Magazine Editors. 320 pages, illustrated (part color), indexed, bibliography. Lane Magazine and Book Co. Menlo Park, Cal. 1965. $11.75.

With the cooperation of the National Park Service, and especially the superintendents and ranger-naturalists of the western states, the editors of Sunset Books and *Sunset Magazine* have prepared an interesting and attractive volume—"a pictorial interpretation of the National Parks in the West."

Helpful information under "Access to Western Parks," "Traveler's Guide," "Historical Chronology," "Park Life Zones," etc., fills the last twenty pages.

PROCEEDINGS OF THE THIRD CONFERENCE OF THE INTERNATIONAL ORGANIZATION OF CITRUS VIROLOGISTS. Price, W. C. (ed.). 319 pages, illustrated, indexed. University of Florida Press, Gainesville. 1965. $8.00.

The papers, which make up this indispensable volume for all who are studying citrus diseases, were presented at the conference held at Campinas and São Paulo, Brazil, in 1963, and show the advances in this field of endeavor since the previous conference held in Florida in 1960.

PLANT INDICATORS OF SOILS, ROCKS, AND SUBSURFACE WATERS. Chikishev, A. G. (ed.). 210 pages, illustrated. Consultants Bureau Enterprises, Inc., New York. 1965. $27.50.

This is an authorized translation from the Russian language of forty-one papers which were contributed to a conference on indicational geobotany, held in Russia in February, 1961. These papers were published as the *Transaction of the Moscow Society of Naturalists*, Vol. III, 1964, by Nauka in Moscow.

The contents include "The Significance of Coedificators in the Indicator Properties of Plant Communities," "The Present Position of the Problem of the Utilization of the Indicator Role of the Vegetation Cover of Bogs in Relation to the Structure and Properties of Peat Deposits," "The Utilization of Forest Vegetation as an Indicator of Deposits of the Glacial Complex," "Determination of Soil and Terrain Conditions from the Vegetation Cover," and "The Use of Botanical Indicators for the Determination of Climatic Boundaries."

THE AGARICACEAE OF MICHIGAN. Kauffman, C. H. 924 pages, indexed. Johnson Reprint Corp., New York and London. 1965. $25.00.

This is the first reprinting of *The Agaricaceae* of Michigan, published originally as a part of the annual report of the Board of Geological and Biological Survey for 1918, Lansing, Michigan, 1918, Publication 26, Biological Series 5.

A HISTORY OF GENETICS. Sturtevant, A. H. 154 pages, indexed. Harper and Row, New York. 1965. $5.50.

In this, the first volume in Harper's series of Modern Perspectives in Biology, an eminent geneticist covers the history of genetics from the days of Aristotle to 1950, and the development of ideas and techniques.

Dr. Sturtevant, who is Thomas Hunt Morgan Professor of Biology, Emeritus, at the California Institute of Technology, has been closely identified with many of the major developments and presents the information in a personal style, enjoyable and easy to read—but some knowledge of genetics, on the part of the reader, is assumed.

FUNDAMENTALS OF SOIL SCIENCE. Millar, C. E., L. M. Turk and H. D. Foth. 491 pages, illustrated, indexed. John Wiley & Sons, New York, N. Y. 1965. $9.95.

The text in this fourth edition of *Fundamentals of Soil*, the original of which was published in 1943, has been considerably revised, new material and new illustrations have been added, as also questions and problems at the end of each chapter.

MOLECULAR AND CELLULAR ASPECTS OF DEVELOPMENT. Belt, Eugene (ed.). 525 pages, illustrated. Harper & Row, New York. 1965. $10.75.

Dr. Bell furnishes a bibliography and summary on the status of some problems, and directs attention to others, on each of the fourteen chapters under which these forty-four research papers by notable scientists have been arranged. The papers are focused on a field of interest in which Dr. Bell is eminent and in which he himself has written widely.

ANNUAL REVIEW OF PLANT PHYSIOLOGY, Vol. 16. Machlis, L. and W. R. Briggs (eds.). 493 pages, author, subject, and cumulative indexes. Annual Reviews, Inc., Palo Alto, Calif. 1965. $8.50.

Scientists from this and foreign countries contribute to the 1965 Annual Review under these Sections: Nitrogen Metabolism, Photosynthesis Respiration, General Metabolism, Water Relations, Absorption and Translocation, Growth and Development, and Special Topics. Under Growth and Development ten authors write on "Stem Elongation," "Physiology of Flowering," "Plant Cell Differentiation," "Physiological Effects of Gibberellins," and so on.

PHOSPHATES IN AGRICULTURE. Sauchelli, Vincent. 277 pages, illustrated, indexed. Reinhold Publishing Corp., New York. 1965. $12.50.

The author is internationally recognized as an authority on fertilizer chemistry and is the founder of the Fertilizer Industry Roundtable. He has almost completely rewritten this book to bring it up to date in accordance with the advances which have occurred in agricultural technology and practices since the first edition was published in 1951.

The purpose of the revised edition remains the same as that of the first, "namely, to help the ordinary man who is more or less interested in the raising of crops and the care of the soil and, particularly, in phosphatic fertilizers and their functions. . ."

THE ANATOMY OF PLANTS. Grew, Nehemiah. 304 pages and index, "explication of tables," and numerous tables. Johnson Reprint Corp., New York and London. 1965. $35.00.

This is a reprint from the 1682 edition of *The Anatomy of Plants*, with an Idea of a Philosophical History of Plants and Several Other Lectures Read before the Royal Society.

In his Introduction, Conway Zirdle, Professor of Botany, University of Pennsylvania, includes a biographical sketch of Grew, one of the pioneers in the use of the microscope and in its application to plant anatomy.

BOOK REVIEWS

WILDFLOWERS IN COLOR. Stupka, Arthur. 144 pages, illustrated (color), indexed. Harper & Row, Inc., New York, N. Y. 1965. $5.95.

Here is another attractive book on American wild flowers. The author is a veteran naturalist of Great Smoky Mountains National Park and an authority on its wild life. The book, though bearing his name, is the result of cooperation between several persons and agencies. Its 144 pages contain 267 colored illustrations, with a brief, non-technical characterization of each species. The plants are Smoky Mountains natives, but most, of course, are found throughout the eastern United States. Reproduction of the color-photographs is fair, certainly as good as can be expected for the price; but not, I should guess, always doing justice to the original transparencies. Jack-in-the-pulpit, Turk's-cap lily, and Oswego-tea are especially disappointing; on the other hand, bird's-foot-violet and Indian pipe are excellently shown. These random samples will indicate the range in quality.

An excellent little book for the non-botanical visitor, so long as he doesn't want to identify every flower he sees.

H. W. RICKETT

PLANT DRUGS THAT CHANGED THE WORLD. Norman Taylor. Dodd, Mead & Co., N. Y. viii + 275 pages, illustrated, indexed. 1965. $5.00.

Botanists and garden writers have discovered that there is a market for books on the relation of plants to the intimate lives of people and have started to exploit the field. The book under review discusses, in an informal chatty manner, some of the medically useful products derived from plants. Mr. Taylor's anecdotes are interesting, well-written, and many of them are new to me. The book is the product of a professional writer—this is a compliment.

RICHARD M. KLEIN

THE MAGIC OF MOLECULES. Franke, Dr. Herbert W. 275 pages, illustrated, indexed. Abelard-Schuman, Ltd., New York. 1964. $6.00.

According to the preface, the book "will have fulfilled its purpose if it succeeds in giving the reader some idea of the mode of thought of the theoretical chemist and an inkling of the fundamental laws of the world of molecules." This it does. The statement that "No scientific background . . . ." is demanded of the reader is, perhaps, somewhat optimistic.

The book is especially valuable for its lucid photographs and diagrams which appear on almost every page. It is, however, marred by numerous minor errors in the text—omissions of editing rather than errors of fact.

The twenty chapters deal with subjects ranging from basic chemical concepts to the borderline of physics on the one hand, and biochemistry on the other. In general, the book is well conceived, well organized, and written in a pleasant, flowing style.

MARJORIE ANCHEL

POLLEN AND SPORE MORPHOLOGY/PLANT TAXONOMY. Erdtman, G. 191 pages, illustrated, indexed. Almquist and Wiksell, Gebers Forlag A.B., Stockholm. 1965.

This is a continuation of the author's well-known work on comparative morphology of pollen and spores of higher plants. The present volume, covering the bryophytes and gymnosperms, is a companion to the earlier volume on angiosperms. A volume covering the pteridophytes remains to appear. The work is indispensable for students of pollen and spore morphology, and it is a must for all botanical libraries.

ARTHUR CRONQUIST

RADIOACTIVE FALLOUT, SOILS, PLANTS, FOODS, MAN. Fowler, Eric B. (ed.). 317 pages, illustrated, indexed. American Elsevier Publishing Co. New York. 1965. $14.00.

Eric B. Fowler, of the Los Alamos Scientific Laboratory, has included, in one volume, reviews on fallout in relation to soils, plants, foods, animals and man, in this sequence. The chapters are based on lectures presented at an American Chemical Society Symposium (1960), but the material has been expanded and brought up to date. The editor stated in the preface that he has not edited out differences between various chapters so that each retains its individuality. Facts and theories of fallout, relative to the divisions listed above, are discussed in eleven chapters, each by a different author or authors. The book contains a wealth of data in tabular form and should be a useful reference, especially since most chapters include an extensive bibliography.

MARJORIE ANCHEL

THE CHEMISTRY OF PLANT PROCESSES. Whittingham, C. P. 209 pages, illustrated, indexed. Philosophical Library, Inc., New York. 1965. $7.50.

This book does not carry out the function suggested in the jacket blurb—integration of the fields of plant physiology and plant biochemistry. It has combined, but not integrated, the biochemical, biophysical, and physiological aspects of plant processes. The presentation and viewpoint do not seem to differ greatly from those in standard texts. The style is acceptable but not inspiring.

MARJORIE ANCHEL

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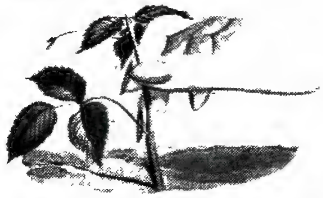

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NORTH AMERICAN SPECIES OF CREPIDOTUS. Hesler, L. R., and Alexander H. Smith. 168 pages, illustrated, indexed. Hafner Publishing Co., New York. 1965. $12.50.

Crepidotus is a genus of gilled mushrooms whose members occur on dead twigs and branches, and on logs and stumps. Most are small and thus not sought after by the mycophagist. In general they resemble small oyster mushrooms *(Pleurotus)*. The spore print is ochre-colored in *Crepidotus;* white in *Pleurotus*. Hesler's and Smith's treatment is entirely taxonomic and stresses microscopic details in the identification of the species. After an introductory chapter giving information on history, morphology, chemical characters, habit, distribution, and phylogeny, the remaining major portion of the book deals with identification and classification.

Keys and detailed descriptions to three subgenera, numerous sections, and to 125 species and varieties are presented. Sixty-two new species and fifteen new varieties are described. Thirty-three black-and-white photographs of fruit bodies, mostly reproduced natural size, both on text paper and on glossy paper, are included as well as ten pages of line drawings illustrating microscopic structures.

While considered by the authors to be only a preliminary account of the North American species, it is a definitive treatment and will certainly allow identification of most specimens which are collected for study. Undoubtedly, the book will stimulate an interest in collecting and identifying the group by all professional and amateur mycologists.

CLARK T. ROGERSON

THE BIOLOGY OF THE ALGAE. Round, F. E. 269 pages, illustrated, indexed. St. Martin's Press. New York. 1965. $7.25.

A general account of the biology of the algae without undue emphasis on any one aspect is the accomplished aim of this book. Introductory chapters on morphology, reproduction, cytology, and genetics are followed by comprehensive discussions on freshwater and marine ecology and on the physiological aspects of culture, nutrition, energy sources and relationships, pigments, movement, rhythm, polarity, and morphogenesis. Line drawings illustrate comon members of many genera of algae. The book concludes with chapters on fossil algae, economic aspects, and taxonomy, the latter being key-outlines with brief descriptions of the divisions, classes, and orders of algae together with lists of genera in each order.

The book presents a wide and up-to-date picture of the role played by algae in nature and shows how extensively algae have provided information on fundamental biochemical and physiological problems.

For botanists, college students, and research workers the book is an excellent source of information and undoubtedly will become a standard reference.

CLARK T. ROGERSON

FUNDAMENTALS OF BOTANY (from page 60) the implications of the development of synthetic rubber and rubber substitutes on the current natural rubber industry are considered. The role of yeast in two major industries, baking and brewing, highlights the chapter on fermentation and included is an outline of the fundamentals involved in the production of beer, wine, and liquor.

In such an introductory survey, only a brief account of the overall contribution of trees to man can be made, and the author divides the chapter into headings of charcoal, wood distillation, hydrolysis and fermentation, pulp and paper, rayon, plastics, and cork, treating each in only a superficial fashion. The chapter on the use of drug plants includes those of both temperate and tropical origin, discusses the role of the lower plants as a source of drugs dating from Fleming's 1928 observations of a fungal contaminant, and pinpoints the economic considerations of the use of tobacco which must be contemplated regardless of the possible medical implications. The rise and fall of the tanning industry is considered under a general heading of tanning and decoration with dyes. This particular chapter includes an excellent sidelight on the use of a "biological control" of an introduced pest, i.e., the prickly pear cactus in Australia, its spread and disastrous effect on the rangelands, and its subsequent control by the introduction of the moth, *Cactoblastis cactorum*.

In the final chapter, the reader is given a look at man's relation to plants in this coming space age. The world's need for more protein in the diet and the increasing role of fungi and algae as this protein source is emphasized, as well as the need for seeking and utilizing new and/or improved higher plants. An appeal for wise use of our natural resources closes the text on a fitting note, and is followed by a list of suggestions for further reading. There is little doubt that the reader of this text will be suitably impressed with the economic implications of the general field of botany.

Both these volumes, *Plants and Civilizations* by Baker and *Plants and the Ecosystem* by Billings, will convey a great deal of adequate introductory material to the reader and, considering the cost, should be welcome additions to most libraries, public and private.

RONALD R. DAGON

A FAREWELL AND SALUTE TO JOSEPH R. SWAN

The New York Botanical Garden lost one of its great leaders and benefactors with the death of Joseph R. Swan on November 6, 1965, at Boca Grande, Florida. Mr. Swan held many offices. He was a member of the Board of Managers from 1934 to 1958. He served as Treasurer, President, and Chairman of the Board of Managers.

His knowledge of the Garden and all its activities was extensive. He contributed keen judgment and great energy to all the Garden's work. He was possessed of personal familiarity with horticulture and was strongly interested in widening the scope and influence of the Botanical Garden as a scientific and educational institution.

In 1945 Mr. Swan vigorously led a fund-raising drive in connection with the fiftieth anniversary of the founding of the Garden. At this anniversary celebration, dreaming of the Garden's future, he stated:

"With my banker's mind I look upon

The New York Botanical Garden as a business concern dealing in fundamental products potentially more important than any of our large corporations—a business concern which, despite the achievements of fifty years of service to community, nation and mankind, is only at the beginning of its career. Its opportunities for still greater service to industry, medicine, science, and human welfare are as great as the potentialities of botany and horticulture themselves and they are almost unlimited. Given the means and the facilities with which to fulfill its founders' vision as a great botanical university, this institution is a gold mine which can pay dividends without measure to body, mind and soul of mankind."

Mr. Swan was a frequent and generous financial contributor to the Garden. As a result of a gift by Mr. and Mrs. Swan, the income from a fund which is expected to reach $250,000 eventually will be available to the Garden. It has a current value of over $125,000.

Mr. Swan led a long and eventful life filled with achievement both as a business leader and as the head of this great botanical institution. Many of us, however, will prefer to remember him as a great and good friend whose counsel and leadership were ever available.

Shortly after his death, one friend, Wilmarth S. Lewis, prepared a most fitting tribute which is reproduced here.

CHARLES B. HARDING, President
The New York Botanical Garden

"Joe Swan died at his house in Boca Grande, Florida, November 9th, 1965. Shortly before his death he told his daughters that he did not want a service similar to Nathalie's, but they believed that he would have wished that his close local friends should meet at his grave. About twenty joined his daughters there at 2:30 on the afternoon of November 15th and the following tribute was read. It is being sent by his daughters to their father's many friends everywhere.

"When we heard of Joe's death we all had the same thoughts: shock at hearing that he had died, thankfulness that he did not have to linger on stricken and helpless, and then we thought of how much we shall miss him.

"He was a stalwart man in every sense of the word. It was easy to believe that he had been an outstanding football player in college, not only because he was big, but because he gave all he had to whatever he did, whether it was a game, business—or making a rock garden. For him life was a challenge that should be met with strength and confidence, but it should also be enjoyed. He never lost his zest for it or the capacity to make everyday experiences delightful. Any gathering was more fun when Joe was in it.

"One reason why he got so much from life was that he was concerned for the welfare of his friends. Everyone here has benefited from his many acts of thoughtfulness and kindness. In an unobtrusive and sensitive way he studied how to please those he loved. He cast his bread upon the waters not in order to find it after many days, but because he liked doing it, and when it did return to him in the form of reciprocated friendship he was rewarded. He would have been touched and pleased by our coming here this afternoon to say goodbye to him.

"Outstanding as were many of his achievements, none, I think, was more so than the way he came down the home stretch, the most difficult passage in life, when it is easy to give up, to complain, to fear, to quit. Quitting was not Joe's way. He accepted the encroachments of age with dignity and wisdom; he made the most of the many blessings that remained. He set an example to be honored and followed.

"He has left with each of us private memories that we shall cherish. One that I have is of his last night in Farmington. He dined alone with me that night to see a Walpole manuscript that had just arrived from London and that he had given me in memory of Nathalie. When I saw him into his car, which James had brought, he said how happy he was that I had this proof of his affection.

"In thanking his beloved and devoted daughters for inviting us here this afternoon I shall repeat the remark that Joe added to my tribute to Nathalie six months ago: He stood beside me while I read it. 'We felt,' his message ended, 'that some of our friends would like to say a farewell to a dear friend. I want to say on your behalf and on mine, "May you rest in peace. Amen."' I am confident that Joe would be pleased that his farewell to Nathalie on his and our behalf has been repeated now to him as well."

LETTERS TO THE EDITOR

It was a pleasure for Mrs. Loreto and me to have met you at the reception given in connection with the dedication of the new library wing.

When Mrs. Loreto mentioned our frequent and almost daily walks through the park, you expressed an interest to know more about them. For me they began on weekends during my high school years. I then found this wholesome exercise and pleasant recreation.

The natural beauty of the botanical park was a constant attraction to me. When my niece Carol was a child, I would take her along at times. On her return, upon being asked where she had been, she would answer, "To Uncle's park."

Since my marriage, Mrs. Loreto, whose home was in Texas, has been introduced to the park and loves every inch of it, as I do. Often, if not daily, she accompanies me on a walk through it. During the past twenty years that I have been serving as a judge in our courts, I have looked forward to these morning walks. They serve to promote my spiritual and physical well-being. The beneficial influence carries me through an arduous day. In the quiet and beauty of the gardens, I am impressed by God's creation and thank Him. Too, I think of all the good people who help to support, maintain, and preserve the Garden for the public. I express my appreciation to all of them from the lowliest gardener to the Director, Dr. Steere. Among those whom I see from time to time, and who brighten the scene, are Mr. Everett, Miss Hall, Mr. Politi, Dr. Pirone, Mr. de la Montagne, and in the past the late Mr. Pfander and Mr. Whitford, who is now retired.

It is a never-ending source of satisfaction to us to share the beautiful woods and gardens with all other persons who love them.

CHARLES A. LORETO
Justice, Supreme Court
of the State of New York

I thought perhaps the Editor and readers of *The Garden Journal* might enjoy hearing about some of the experiences of a northern New Jersey "transplant" to this part of the country — Lake Hamilton, about nine miles from the center of Hot Springs.

Even though we bought an almost-finished new house, there were things to be done, after husband Zeh and I moved in, that we had not thought of. We had gutters put on the house, also four fifty-gallon drums with faucets at the downspouts. When our yardman saw them, he immediately asked, "*What* rain?" It has been so very dry so very long. Rainfall in the State of Arkansas as a whole has been, I understand, almost ten inches below normal for the year 1965. We are still sharing one thing in common with our friends up North—drought!

However, the day after we planted three deodaras *(Cedrus deodara)* and three more hollies (two *Ilex cornuta* and an *I. opaca* 'Foster's Hybrid', to join several previously planted *I. cornuta* 'Burfordii'), the gods must have felt sorry for us, because a slow, gentle rain fell for a little over an inch.

There wasn't a really good tree on the property, except a large hickory on the north side, so we also planted a 'Shademaster' locust and a 'Cloud 9' dogwood from an Indiana nursery, and hope they will live and perform well.

I was entranced with abelia and nandina at the beginning, but I've recovered from my enchantment. As pachysandra is the gardener's last resort up North, these shrubs are his last resort here. If abelia didn't bloom I should like it, for the plant itself is lovely; but it bears the little, white or pinkish flowers continually and they make it look so unattractive and dirty. The U.S.D.A. has, I believe, developed a form with pinker blooms—that would be better. There are many shrubs we can't have here—no yew, no leucothoë, no kalmia. But we really do not yet know what will and what will not grow—we shall just keep on trying.

We have lately been filling in around a

low wall, hoping that it will be a fair place for *Iris pumila,* and the remaining spaces for sedums and thymes and other heat-loving little plants.

The irises have been very poor. I never thought it possible for irises to look so ghastly. One woman who has been growing them in this locality longer than any one else told me she never waters them. So I followed her advice, and did not water ours. They practically made bushes —and then dried up in the hot sun. The seedlings came on like two- or three-year-old plants. In September, when I saw some of them putting up that odd S-shaped leaf, as some do when they are getting ready to bud, I watered those seedlings and had more than thirty first-year blooms! But that, of course, will not happen in a normal year.

The first to bloom was from a cross of my new reblooming project [now named 'Twice Blessed', and expected to be introduced this year], and I was elated. I really had something! When other plants which had no reason for reblooming came out, I realized all this was just the result of the abnormal season. A gardener swaps one set of troubles for another when he moves from one part of the country to another. Here, I'm sure, there will never be iris rot from too much water, and there are no iris borers. But early freezes—I mean, late spring freezes—get some of the bloom stalks, and irises do burn up in summer.

I did enjoy Kitty Simpson's comment that Editor Hansell would probably change pine straw to pine needles. When our yardman said he would bring us some pine straw, we didn't know what he was talking about. But no wonder they call these needles straw—some of them are almost ten inches long, and they do not turn that pretty golden color with which we're more familiar.

We'll be north in May, 1966, for the American Iris Society Convention in Region 19. From what we've seen so far in our travels, no region can surpass the irises of Region 19 when the season is even fair.

Dorothy Dennis
Hot Springs, Arkansas

I enjoyed Dr. Shiu-ying Hu's article in the November-December, 1965, issue of *The Garden Journal* but found two errors —in the sentence starting the second column on page 250.

First, the evergreen hybrid magnolia which looks more like *M. grandiflora* than its other parent *(M. virginiana)* is correctly named 'Freeman', for Oliver M. Freeman, the retired botanist who made the cross while he was with the United States National Arboretum. Second, magnolia 'Verbanica' is not at all like *M. virginiana,* not even belonging to the same subgenus. 'Verbanica' is apparently a European seedling of × *M. soulangiana.* It was first offered by nurserymen in The Netherlands some fifty years ago.

I make mistakes too, for I wrote in a letter published in the July-August, 1965, issue that *Magnolia sharpii* of Chiapas, Mexico, was almost glabrous. I have since seen the late Dr. Faustino Miranda's original publication on it, and specimens collected by him and other botanists, D. E. Breedlove of Stanford University being the most recent. Typical *M. sharpii* has densely pubescent stems and lower leaf surfaces.

My consolation is that the different magnolia I collected in a stand a few kilometers away from one of the *M. sharpii* localities, will, when it flowers on a graft at the United States National Arboretum, probably be a species new to science as well as new in cultivation. Mr. Breedlove has now supplied the National Arboretum with some *M. sharpii* scions. These, like my scions of *M. guatemalensis* and its unnamed Chiapas relative, have been grafted in the greenhouse there on *M. grandiflora* understocks to furnish material for future breeding with native species of the United States.

Joseph C. McDaniel
Assistant Professor of Horticulture
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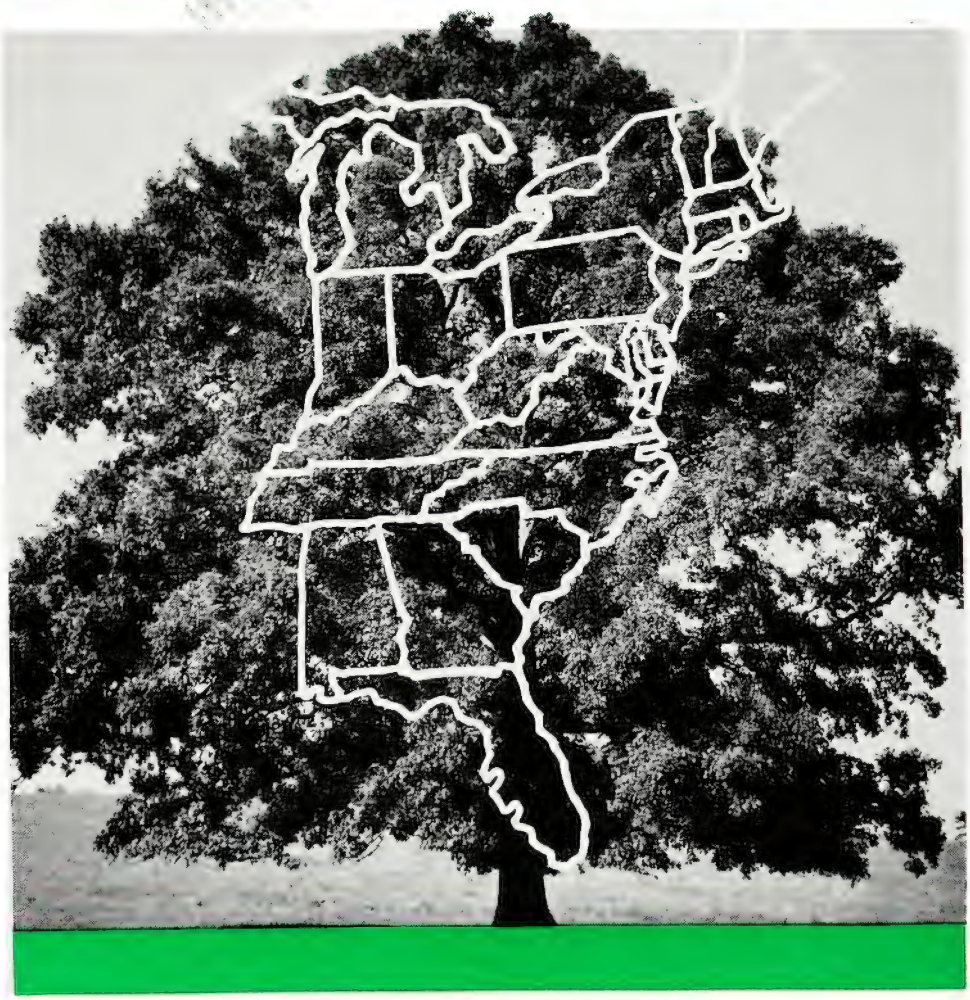

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THE GARDEN JOURNAL

DOROTHY EBEL HANSELL, *Editor*

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Front-cover illustration—a clump of white birch at The New York Botanical Garden, pp. 110, 111, 112, Walter Singer; pp. 82-85, p. 87, by Jean G. and Joseph A. Witt; p. 88, upper left, Charles C. Clare; p. 88 lower right, p. 89 Elizabeth A. and Ira Wood; p. 91, Gottscho-Schleisner; p. 92, H. Lincoln Foster; pp. 93, 94, Joseph Starek; p. 96, Charles H. Overly; pp. 98-100, Helen D. Carswell; pp. 102, 103, F. Gordon Foster; pp. 104-107, 109, George A. Elbert; p. 114, lower left, The Park Association of New York City; p. 117, Margaret Donnald.

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1 - *Iris korolkowii.*
2 - *Iris hookeriana.*
3 - *I. reticulata* 'J.S. Djet'.
4 - *I. magnifica alba.*
5 - *I. monnierii.*
6 - *I. forrestii.*
7 - *I. wilsonii.*

SPECIES IRIS

By JEAN G. WITT

Jean (Mrs. Joseph A.) Witt has been interested in irises since childhood, but particularly since college days when she was a botany major at what is now Washington State University. She has been a member of the American Iris Society since 1947, and is now serving as Chairman of the Miniature Tall Bearded (table iris) Division of the Society's Round Robin program.

Mr. and Mrs. Witt — he is Assistant Director of the University of Washington Arboretum —go in for rock gardening, plant photography, hiking and camping. Their three daughters are likewise outdoor-minded and all enjoy botanical "busman's holidays" to the nearby Cascade Mountains.

THE GENUS *Iris* has much to offer our gardens: its two hundred-odd species grow around the world, from the subarctic to the near tropics in the Northern Hemisphere. They inhabit seashores and high mountains, swamps and deserts, forests and grasslands, yet most adapt well to garden conditions. They exhibit a wide range of size, color, and form; nearly all have garden value.

Most of the named varieties fall in these major horticultural divisions: Bearded (including Oncocyclus and Regelia), Bulbous, Spuria, Sibirian, Japanese, Louisiana, and Pacific Coast. Hundreds of avid amateur hybridizers are at work in all sections, busily combining and experimenting with the wealth of collected species material that has become available since World War II. In the minor divisions of the genus — which some would define as the only proper realm of "species iris"—the variations, if any, are collected or selected; hybridization plays little part.

The role of wild species varies considerably from one group to another. The wild bearded species of Europe and Asia have been so completely outclassed by their thousands of cultivated descendants that they are almost never recommended as garden ornaments. ('Germanica' and *I. pallida,* of course, march merrily onward oblivious to such opinions!) A few exceptions come to mind. The many color variations of the dwarf *I. pumila* are worthy garden subjects in themselves, as is the ruffled blue *I. illyrica.* The yellowish green *I. imbricata* is interesting, if one can find the form with flaring falls. A few species have already produced spectacular new races of garden plants; many more are still in the trial stage.

The Oncocyclus species with their large, exquisitely patterned flowers and their fellow-Arils, the Regelias, have the reputation of being difficult in the ordinary garden where summer rainfall or summer watering is the rule. However, those of us who are not prepared to cater to the special drought conditions which their Asian origin demands can find a measure of their exotic

8 - *Iris laevigata.*
9 - *I. unguicularis.*
10 - *I. decora (nepalensis).*
11 - *I. missouriensis.*

looks in the "Arilbreds"—hybrids with the easily grown bearded types, both tall and dwarf. Those who are willing to fuss a bit will find the Oncocyclus-Regelia hybrids, produced in Holland early in the century, well worth the extra trouble. Many of these show the prominent striping of *I. korolkowii.* Special raised beds over a layer of crushed rock make it possible to grow them even in our rainy Seattle climate.

My only experience with the allied Pseudoregelias was a glimpse of *I. hookeriana,* which rotted immediately after blooming. Its violet flowers with darker mottlings are unlike the flowers of any other bearded species. Their garden possibilities should be explored further.

To turn to the bulbous groups, the Spanish irises, descended from *I. xiphium* which is a native of southern France and North Africa, long ago eclipsed the wild species and have themselves been all but eclipsed by the so-called Dutch type. Dutch irises are larger and earlier blooming than the Spanish, and more varied in color; they have become an important florist's flower. Catalogs offer named varieties of both races in many variations of blue, yellow, and white. The remaining species of the Xiphium group are somewhat tender and rarely available, though one might wish for the red-purple-flowered *I. filifolia.* What role they may be playing in the future development of the group, I do not know.

July-blooming *I. xiphioides,* the so-called English irises, came originally from the moist mountain meadows of the Pyrenees and also appear far removed from the species. Flower colors include white, light to dark blue, and orchid to red-violet; the royal blues are particularly attractive. The cylindrical, silvery green foliage dies down after blooming, but in our climate these irises can be left in the ground year after year and they ultimately form large clumps. Further development of color and form seems unnecessary—but much could be done toward breeding resistance to the virus that often disfigures the flowers.

The members of the early spring-blooming Reticulata group are universal favorites with rock gardeners. They grow four to six inches high, and their needle-like leaves elongate after blooming. Though native to the dry mountain regions of Asia Minor, they do quite well in a sunny, well-drained location. We grow ours in plunged pots, partly to avoid losing the tiny bulbs, but primarily so they can be lifted for a complete summer drying—and also for the fun of bringing the blooming pots indoors! Several species and many named varieties are currently in commerce. Rear-Admiral Paul Furse and others have recently collected additional forms in the wild, so that an even broader color range should be available in the future.

Iris bakeriana is blue-flowered, with quaintly spotted falls and an indigo blotch; *I. histrio* has flowers of lilac blue; 'Aintabensis' has smaller, pale blue flowers. The flowers of *I. histrioides* vary from light to dark blue; the variety 'Major' has flowers of a bright blue with dainty yellow markings, and it blooms in January. Additional variants are easily obtained from seed. *I. reticulata* itself has flowers of a rich purple with a gold crest and the fragrance of violets. Its many named varieties or hybrids range from light blue to deep red-violet. *I. danfordiae,* yellow with green dots, has a reputation for splitting into bulblets after blooming and being slow to bloom again. We bloomed *I. winogradowii,* also yellow, in three years from seed and find it vigorous and reliable. *I. vartanii alba* is a dainty, pure white which may bloom as early as December; the delicate gray-lavender type is seldom offered.

The Junos, another spring-blooming bulbous group, are set off from the rest of the genus by many peculiar traits; the taller sorts have shining, two-ranked leaves like corn; the flowers are borne in the leaf axils, and the style-arms are the conspicuous upper parts, while the standards are reduced to mere pendant wisps; the easily damaged storage roots, which are like thin, white carrots, grow from the base of the bulbs. Though there are many species which range from the Mediterranean to Iran and Soviet Central Asia, only a few are available, and they are little grown in the United States. They require a sunny, well-drained location and benefit from a summer baking. The two most readily obtainable species are *I. bucharica,* with white and yellow flowers, and *I. magnifica,* blue with a yellow signal.

Closely resembling the Xiphiums in appearance, but rhizomatous, are the members of the Spuria group. Native to ditches and salt marshes throughout Europe and Asia, they are a hardy lot, not particular about soil. Hybridizers are working principally with the taller types and have barely touched the many available combina-

tions. Dealers' catalogues offer a host of cultivars in yellow, blue, and white, as well as brownish blends. Spurias are grown by the acre as a florist's flower in certain parts of South Africa. The flowers make fine corsages because of their great substance, and the pointed, ribbed seed pods are attractive for dried arrangements.

In the strict sense, *I. spuria* is a blue-flowered, moisture-loving species of northern and central Europe. Allied species and color forms are found from Spain and Algeria eastward through Asia Minor to Kashmir. *I. crocea (I. aurea)* is a stately plant with golden flowers; *I. monnierii* is lemon-yellow. *I. ochroleuca,* white with a yellow signal, has passed its color pattern to many named clones of greatly improved form. The name *I. halophila* covers a complex of Near and Middle East forms with flowers in gray-purples and dull yellows. *I. notha,* however, is deep blue. The flowers of *I. songarica,* which extends from Iran to western China, may be lavender or cream.

There are also several smaller species of considerable garden value which are not related to current Spuria cultivars. *I. sintenisii,* native to Italy, the Balkans, and Turkey, forms foot-high clumps of spidery, brilliant blue-violet flowers. It has done very well for us in a dry, somewhat shaded rockery. The flowers of *I. graminea,* a species native from southern Europe to the Caucasus, tend to be hidden in the leaves; they have prominent pinkish purple style-arms and violet-purple petals. We much prefer the variety that the Russians call *I. colchica.* Its flowers are also borne down in the foliage, but are almost four inches across and occur in sufficient profusion to push the leaves aside. The yellowish green foliage with its lax tips gives the clumps a pleasing fountain-like appearance. The flowers of *I. graminea* var. *pseudocyperus* from the Carpathian Mountains vary from dirty yellow to yellowish green. *I. kerneriana* is another pale yellow-flowered species native to Armenia and Asia Minor.

The Sibirica group is also attracting increasing attention from hybridizers. Originally, almost all the named garden Sibirians were derived from two species: *I. sibirica* of eastern Europe, which has tall, branched stems and blue or milky white flowers, and the southeast Asian *I. sanguinea,* with medium blue, rarely white, flowers just above the foliage and attractive red spathes. Today's cultivars vary greatly in height. Flower colors range from white through light and dark blue and from pinkish lavender to deep royal purple. Self-colors predominate, though I have an interesting nameless clone with blue standards and white falls striped in blue lines.

The other species of the Sibiricas are not only fine garden flowers in themselves, but promise to give outstanding hybrids. Large, pendant falls are characteristic of the group. *I. chrysographes,* the most outstanding of the lot, is famous for its velvety, dark red-violet flowers. The falls are laced with yellow lines—the "golden writing" of its name. Selections run from ruby-red to deep violet, with and without the gold lines; some are named. The buds appear black before opening, and recently I saw a seedling in which the petals had remained black! Two-foot-high *I. forrestii,* lemon-yellow with a signal of black lines, and *I. wilsonii,* taller and stouter, in straw-

12 - *Iris douglasiana* 'Agnes James'.
13 - *I. innominata.*
14 - *I. cristata.*
15 - *I. setosa.*

yellow with a pattern of brown dottings, are both from China. *I. delavayi* is a strapping five-footer with flowers in light to dark blue. *I. clarkei* from the Himalayas is also blue-flowered and has a branched stem. *I. bulleyana,* heavily spotted in blue-violet, is variable from seed. Hybrids between the various species appeared almost as soon as they were grown together in gardens. Those I have seen run to muddy mauves and dull gray-blues, but advanced generations bring more desirable combinations. I've had dwarf yellows covered with brown dots and tall, flaring flowers dotted blue on paler blue or ivory. M. E. Kitton in England has recently registered a series of complex hybrid origin, which includes apricot tones.

The Japanese irises have been extensively cultivated for at least five hundred years, and a tremendous elaboration of flower and a considerable range of colors have been developed in them. The ancestral species, *I. kaempferi,* native to Japan and the swamps of Manchuria, (and much confused with *I. laevigata* and *I. ensata*) no longer plays any role in their development. Entire catalogs are devoted to named varieties; the wild form, var. *spontanea,* is seldom offered, though seeds are passed around among species "buffs." It has bright red-violet flowers, with small standards and large, drooping falls, and prominently ribbed leaves.

Two groups of American species, on the other hand, are just emerging from the wild to the cultivated state. The first of these, the Louisiana irises, are derived from three species native to the Mississippi delta region: copper-colored, swamp-dwelling *I. fulva;* the dwarf, blue-flowered pasture iris, *I. brevicaulis (I. foliosa);* and *I. hexagona* var. *giganticaerulea,* a tall blue- or white-flowered inhabitant of coastal marshes. Wild hybrid swarms, with spectacular color variations including yellows, buff-pinks, and wines, attracted the attention of botanists and collectors during the 1920's. Hybridizers soon recognized that this native group had as great a garden potential as any of its Old World relatives. While I have had trouble getting them to bloom in western Washington—apparently because of too-cool summers rather than too-cold winters—the Louisianas have much to offer in many parts of the country beyond the southern states. They are attractive pool or bog garden subjects and are also adaptable to moist border conditions.

The Pacific Coast irises, a group of eleven species native to the western side of the Cascade-Sierra range from southern Washington to southern California, are great favorites in their own states and in England; unfortunately, they are not hardy over much of the United States. *I. douglasiana* forms large clumps of shiny evergreen leaves topped with frilly blossoms of pleasing form. It is the most important species from the standpoint of named selections, and it is a fine arranger's flower. *I. tenax,* which has narrower, deciduous leaves, is the most northern species and is somewhat hardier than the rest. *I. innominata* is famous for its golden flowers, but all three species occur in a color range from blue to yellow, often with conspicuous signal patches. Many interesting variations are found in the wild; natural hybridization occurs among the various species of

16 - Iris 'Saffron Charm', an Arilbred Regelia hybrid.

the group, particularly where man has disturbed their habitats by logging. Many named clones have been registered. However, because of difficulties in transplanting and shipping, they remain chiefly in the gardens of the originators and a few species fanciers; they have not obtained the distribution they deserve. Except for *I. munzii,* which is known to give beautiful blues, the remaining species have made little contribution to present hybridizing programs. Hopefully, some of those from higher elevations may be persuaded to impart increased hardiness.

Increased hardiness is also being sought through crossing the Pacific Coast irises with the species of the Sibirian group. Red-violet 'Margot Holmes', an *I. chrysographes-I. douglasiana* hybrid raised many years ago in England, is still the only named variety of this type in commerce. Several West Coast hybridizers, including myself, are currently experimenting to find which species will combine most effectively. Our aim is to develop a deciduous Sibirian-type plant having flowers with the form and color range of the Pacific Coast irises. Though the F_1 are sterile, they are colorful and vigorous, and we anticipate an outstanding race of garden plants in the near future.

Several members of the Evansia or Crested group are favorites with species fanciers. Their distinguishing feature is a prominent fimbriate ridge, like a tiny rooster's comb, where the beard would be on a bearded iris. *I. cristata,* a dwarf plant from northeastern United States, forms large, interlocking mats of rhizomes and in April puts forth many flat, starry flowers about two inches across. My best clone is a medium lavender with an embroidered, rectangular signal like a little, white apron. The white form lacks the vigor of the type. *I. lacustris,*

with somewhat smaller flowers of similar color, is inferior from the garden standpoint and not easy to find — one invariably receives *I. cristata* instead. Slender, white-flowered *I. tenuis,* an uncrested Evansia relative from moist woods in western Oregon, is tender and difficult, chiefly a collector's item.

A woodland species of central China and Japan, *I. japonica,* is a greenhouse subject except in California and the southeastern states. Its slender, many-branched stems bear numerous small, airy, white flowers over a long season. A form with striking variegated foliage is grown in Japan. The hybrid 'Nada' is marginally hardy in Seattle; however, the evergreen leaves become so disfigured in winter that they detract completely from the flowers.

The roof iris, *Iris tectorum,* has been cultivated in China and Japan for centuries and actually is grown on the thatched roofs of houses. The flowering stems are about a foot high; the three-inch, ruffled flowers in orchid have darker mottlings and a white crest. The white-flowered form is particularly lovely. This iris thrives under ordinary garden conditions; the soil should be renewed occasionally to keep it blooming.

Iris milesii, from southeastern Asia, has smaller flowers on a taller, more branched stem. It has been quite hardy with us, surviving weather down to 6° F. last December. It forms large clumps which produce a profusion of small, mottled red-violet flowers with conspicuous fimbriate style-arms.

Smallest of the crested species is *I. gracilipes,* native to Japan, a tiny, slender plant for the half-shady rock garden. Delicate lavender flowers are borne on six-inch stems from clumps of fine grassy foliage. A white form is in commerce, and a double one, the most un-iris-like 'Blue Rose'.

The vesper iris, *I. dichotoma,* which belongs to its own section, Pardanthopsis, is native to China. In garden appearance much like a taller *I. milesii* without a crest, it produces a succession of small, lavender-spotted flowers in August on a four-foot, dichotomously branched stem. Each flower lasts only a single afternoon. It has the reputation of being short-lived in the garden; one can avoid the risk of losing it by saving seed each year. 'Shilka' is a variety of this species.

There are other valuable European and Asiatic species. Of particular interest because of its "off-season" bloom is the fragrant, winter-blooming *I. unguicularis (I. stylosa),* native from Algeria to the Black Sea. From November to February (depending upon the clone) the fragile, pale violet flowers appear successively from the harsh evergreen leaves; if frost catches them, others soon follow. Seattle must be near the northern limit of its hardiness, but it has thrived for us in a warm, well-drained location against the south side of the house. Pink, white, and marbled are among the color variants which have been offered.

The flowers of *I. laevigata,* a water-loving species native to Japan and China, somewhat resemble those of *I. kaempferi,* but they are a smooth, satiny, medium blue —perhaps the bluest of any iris. It also has a long history of cultivation in Japan, some named varieties going back to the seventeenth century. Single and double whites, doubles blues, and lavender-pinks are grown in England; there are also forms with blue dotting. One of these, 'Albopurpurea', was described by Dykes as looking like ink spots on a blotter. The University of Washington Arboretum raised a spotted double from seed.

The yellow flag, *I. pseudacorus,* native from Europe through Asia and naturalized in many places in America, need not be a menace in the garden, if the seed pods are cut off immediately after flowering. Otherwise, every seed will germinate—a friend of mine found germinating seedlings even floating on her fish pond! Fortunately, the plants are somewhat less strapping when grown in a border instead of a swamp, and the bright yellow flowers with their large, pendant falls are really lovely. A number of color forms are in circulation, including one with variegated foliage. 'Bastardi' has creamy flowers; others are nearly white. Forms from Japan are dwarf in stature.

The Gladwyn iris of Europe and North Africa, *I. foetidissima,* is grown chiefly for its gay red-seeded pods; the dull blue flowers are insignificant. A pale yellow-flowered form is grown in England, also one with variegated foliage.

Iris ensata (I. lactea), one of the most widespread irises of Asia, occurs from Kashmir to China. It has coarse grassy foliage and rather spidery flowers. Some forms are good, others poor. Variety ***hyacinthiana*** from Yunnan and Tibet has soft blue flowers veined brown, with the odor of hyacinths. Cream and lavender forms are described as among the best; whites have been reported. Though perfectly hardy, it blooms poorly with us—perhaps our winters are not cold enough and our acid soil not to its liking. It is said to do well in the plains and mountain states.

Iris decora (I. nepalensis) from the Himalayas has small, violet flowers with very large style-arms. It has survived several severe winters in Seattle, but its garden value is limited by the fugacious nature of the flowers.

The several remaining American species are among the best. The eastern blue flag, *I. versicolor,* though native to streamsides and damp meadows from the Mississippi Valley through the northeastern states and into Canada, is quite at home in a well-watered border. My best form is a smooth, medium blue with a white signal; another, in dull blue with darker veins, is fragrant. A number of color variations have been described of which the most readily available are 'Kermesina', rich red-violet with a prominent signal, and 'Rosea', a delicate shell-pink without markings, delightful for arrangements. (Seeds of 'Rosea' have given me some fine darker pinks.) There are also violet and white forms.

Iris virginica is a blue-flowered species from the pine flatlands of the Southeast. Though it grows in the same regions as the Louisianas, it does not hybridize with them and is said to be somewhat more cold- and drought-resistant. Several pink- and white-flowered forms are in commerce. The form sold as *I. caroliniana* or *I. carolina* has nearly black stems and large flowers; its new spring foliage is a startling purple. Variants of *I. shrevei,* the Mississippi Valley form, have been described as white

bordered in blue after the manner of the old bearded iris 'Mme. Chereau'.

Iris setosa, native to subarctic regions from eastern Asia across America, was dismissed by Dykes as having flowers of a leaden purple. Alaska and British Columbia forms, however, vary from deep blue-violet to milk-white, with fine, smooth, medium blues. In form they are somewhat reminiscent of a single Japanese iris, the standards being reduced to mere pegs. A plant from Russian seed has royal purple flowers; one from Japan is similarly colored and very vigorous. Forms with variegated foliage have been reported. Variety *hookeri,* a dwarf from eastern Canada, produces a wealth of slate-blue flowers in tidy six-inch clumps; some clones tend toward double flowers. A related species, *I. tripetala,* from the southeastern states, with purple spotted blossoms, is not reliably hardy, and is essentially unavailable. A recent hybrid between *I. setosa* and *I. tenax* is proving to be a vigorous plant of considerable garden value. Registered as 'Elvie B. Page', its flowers are lavender-blue with an infusion of yellow through the center; they resemble an *I. setosa* flower with large standards. The plant is exceptionally floriferous.

The western blue flag, *Iris missouriensis,* is the most widely distributed of the American species. It inhabits wet meadows and river bottoms from northcentral British Columbia to Arizona and South Dakota, from sea level in western Washington to twelve thousand feet in the mountains of Wyoming. There are many variations in height and flower form. Plants from Julesburg, Colorado, are said to have from seven to eleven flowers per stem. 'Snowbird' and 'Bluebird' are two Rocky Mountain forms which have been in commerce for many years. B. LeRoy Davidson has recently registered some color selections, varying from blue to orchid-pink and white. *I. longipetala,* a closely related species from the area around San Francisco, is a taller, larger-flowered plant with foliage tending to be evergreen.

Iris verna, a choice dwarf from the southern Appalachians, grows well in the Seattle area. It has been described as inhabiting granite ledges in thin shade under oak trees; our birch seems to suit it equally well. Its small, lavender-orchid flowers have a brilliant orange ridge where the beard should be; from the botanist's standpoint, it forms a bridge between beardless and bearded types. Mrs. J. Norman Henry collected a series of color forms in Bath County, Virginia, many years ago which seem to be no longer in commerce. Their colors suggest that it might be worthwhile to look for such variations again.

17 - The Japanese iris garden in the University of Washington Arboretum, Seattle.

Iris prismatica, native to the northeastern coast, has wiry stems and spidery, pale blue flowers resembling a tiny Sibirian. Pink- and white-flowered forms have been described, but do not seem to be in commerce.

All our American species have come under the scrutiny of gardeners and most are fairly widely grown. There are still many species in Asia, however, which are not in cultivation in the West. Someday, perhaps, a change in the political climate will bring them, too, to our gardens.

AMATEUR IRIS HYBRIDIZING

By ELIZABETH A. WOOD

Dr. Wood, who is a crystallographer, has been on the staff of Bell Laboratories in Murray Hill for over twenty years. She and her husband Ira, an electrical engineer and also on the staff of Bell Laboratories, have a beautiful garden in New Providence, New Jersey. Its thick greensward is the product of Mr. Wood's tireless attention; the herbs and rock garden plants reflect Dr. Wood's care—*Gentiana acaulis* blooms prolifically for her. Together they grow irises well, display them attractively, and engage in breeding new hybrids of good color and form by applying their scientific knowledge.

IN 1965 OVER nine hundred names of new irises will be added to the long list in the office of the registrar of the American Iris Society. Most of these will be the result of hybridizing by amateurs, people with moderate-sized gardens who have discovered the game of iris hybridizing. The list will include contributions from all over the world, since the A.I.S. registrar is now the official world registrar, the International Registration Authority of the genus *Iris.*

Although most of these new cultivars will be of the tall bearded variety, the medians, standard dwarfs, miniatures, and borders will be represented as well as the non-bearded Japanese and Siberian varieties. Many, but not all, will find their way into commercial catalogues

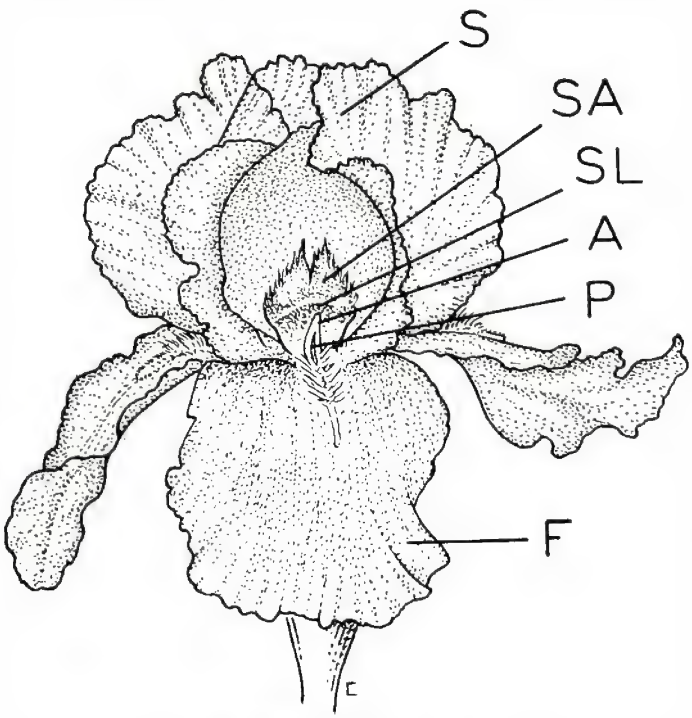


Diagram of flower parts: A) anther; F) falls; P) pollen; S) standards; SA) style-arm; SL) stigmatic lip.

and become available to the gardening public. Some will fetch an initial price as high as $35.00 a rhizome, but few hybridizers are in the game for the financial rewards.

Most of them probably started with a few plants given to them by a friend or bought in a bargain collection from a garden magazine advertisement. Then they became increasingly attracted to the proud form and fine color of the iris, invested in better varieties, joined the American Iris Society and attended its garden-tour conventions. Many who attend the conventions are hybridizers and their enthusiasm is catching.

The process of pollinating an iris is so simple, the possibilities so limitless, and the results occasionally so rewarding that the game has all the fascination of a lottery.

The process of pollinating an iris consists of placing the pollen from the pollen parent onto the stigmatic lip of the desired pod parent. Bagging, removal of petals, or emasculation of the pod parent are considered unnecessary by most hybridizers, because the proportions of the present-day flowers are such that pollination by insects is a rare event. The bee is attracted by the beard, which has nothing to do with pollination, but the iris flower is so big that the bee's back does not touch the pollen. Further, the stigmatic lip of most flowers is so tightly pressed against the style-arm that even a pollen-dusted bee would be unlikely to deliver the pollen to the upper surface of the lip, where it must be placed if the ova of the flower are to be fertilized.

The hybridizer usually removes the whole anther with the aid of tweezers and carries it to the flower he wishes to pollinate. By bending the style-arm inward, he exposes the upper surface of the stigmatic lip and wipes the pollen onto it from the anther. A freshly opened flower or one still in the process of opening is considered especially favorable for the pod parent, but the pollen-parent flower should have been open long enough so that the pollen has become fully ripened and dry.

One reason for choosing a freshly opened flower as pod parent is that insect pollination does occasionally take place, though on a small fraction of one per cent of the flowers of tall bearded iris. The careful hybridizer prefers to get there ahead of any insect, to make sure that he knows the parents of the seeds that develop.

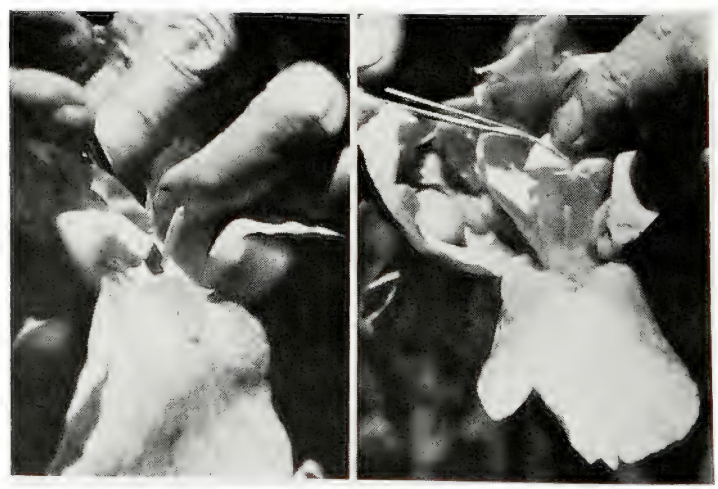
Not all crosses "take." Some irises are "difficult" pod parents; some are difficult pollen parents. Indeed, some have no pollen at all on the anther, which then stands in front of the style-arm as a thin, ivory-colored, naked, little stalk.

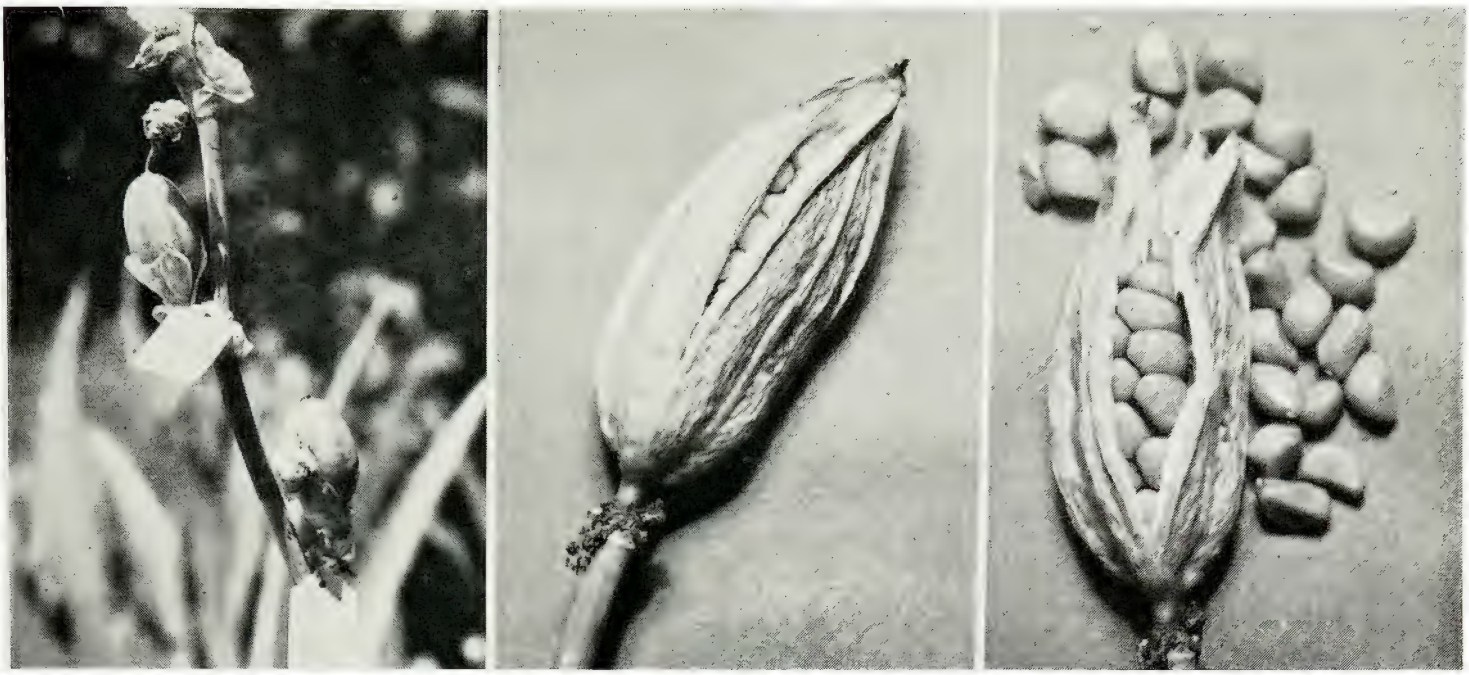
If the cross takes, the ovary just below the flower begins to swell a few days later. In a little more than two months it is large and brown and beginning to split open. The hybridizer harvests it with its identifying tag and shells out the rust-brown seeds which lie in closely packed rows like kernels of corn. These are planted in the fall, when the ground is too cool to encourage germination, and allowed to freeze and thaw through the winter months. In spring the new iris plants will come up and the following spring the first newly created flowers may be seen.

The possibilities do indeed appear to be limitless. The number of chromosomes in today's tetraploid tall bearded iris is about forty-eight. Hybridizing has been so varied and extensive that a wide range of color, form, and other characteristics is likely to enter into the genetic background of any individual. One has about as much chance of predicting characteristics in detail as one has in the case of human beings. Some dominant and some recessive characteristics have been recognized, but there is as yet no sure road to success.

Are there any guide lines? Go to any meeting of the American Iris Society and you will get a great deal of advice on the subject, some of it conflicting. One of the most reliable recommendations, however, seems to be, "If you want to produce a better iris of a particular color, get the two best irises of that color you can find and cross them." "Wide crosses," such as red crossed with blue, dark purple crossed with yellow, generally give a disappointing yield of poor lavenders, a throwback to their common ancestor, but there are some out-

Left. Taking the anther from iris 'Fair Day'.
Right. Putting pollen from 'Fair Day' on iris 'Sunshine'.





Left. Iris pods with identifying tag. Center. Pod beginning to split open. Right. Pod and rust-brown seeds.

standing exceptions to this generalization.

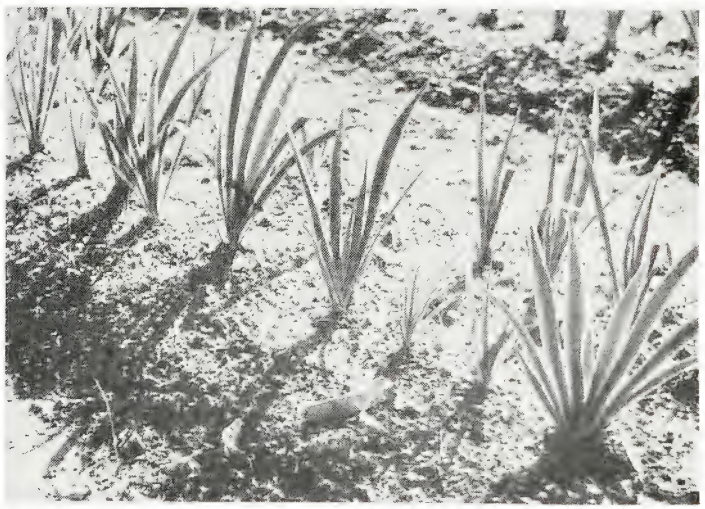
What constitutes a "good" iris, and what do you do if you get one? The judgment of beauty is a subjective judgment. A flower which appeals to you may not appeal to me. Certain characteristics, however, have such wide appeal as to constitute a basis for judgment. Most irisarians agree that the color of an iris should be clear, not muddy or grayed. Strong marking is not regarded with favor especially when it occurs near the beard, as it commonly does. The standards should stand up proudly. Some say they should close at the top. Others would not insist on this, but all agree that they should not hang open loosely. The falls should be broad and flare gracefully so that they do not look like the tongue of a dog on a hot day. The petals should be of firm substance so that they come through a wind storm untorn and do not go limp in the rain. Good branching, many flowers, and a firm, vigorous plant are desirable characteristics here as in many other plants.

If a fine iris with all these qualities results from your hybridizing, what do you do? The iris increases by the growth of new rhizomes from the old rhizome, the fleshy, tuber-like part of the plant from which the roots reach down into the ground. The increase will give you new plants, bearing flowers exactly like the first one. Subsequent increase from the rhizomes will serve to augment your stock. After a year or two, if you are still convinced that your iris is superior to those currently available, you may wish to send a rhizome from it for display at one of the annual meetings of the American Iris Society. Sent two years in advance of the meeting, it will be planted in one of the display gardens and receive tender loving care until the day of the convention, when it will be viewed by several hundred irisarians. If you wish to name it, the name must be registered with the American Iris Society Registrar. (Information about all this is available through the Secretary of the American Iris Socity, Clifford W. Benson, with headquarters at 2237 Tower Grove Boulevard, St. Louis 10, Missouri.)

As in all hybridizing, the disappointments outnumber the successes many times over. The not-too-bad results keep the hybridizer's hopes bright, however, and they always look a bit better to him than they do to an outsider. There is a story of two convention visitors viewing a seedling, identified only by the hybridizer's num-

Iris seedlings growing in a container.

Seedlings in a bed, the fall of the first year.



ber in a convention garden. One said to the other, "Look at that thing. Nobody but its mother could love it." From behind them came the response, "I guess you're right, but I'm its mother and I love it."

Occasionally the results are rewarding—rewarding in personal satisfaction, in prizes and medals, in financial returns. To walk past a row of drooping, muddy-colored seedlings and come upon one which has clear color, holds its standards erect, and has gracefully flaring falls is a rewarding experience. There is a whole series of goals in awards for the hybridizer. The votes of five local judges will win a "high commendation" for his seedling and start it on a long sequence of awards which could culminate in the coveted Dykes medal, awarded here by the English irisarians in any year when there is an iris worthy of it.

Finally, there are those who make money from iris hybridizing. Whether they lose their amateur standing is a matter of definition. The commercial dealers are eager to buy all the stock of any iris which has attracted favorable attention at an A.I.S. convention. Some amateurs have helped to defray the expense of the many costly irises they have bought by selling the plants of one successful result of their hybridizing efforts. An eastern hybridizer put his son through college on his iris profits! For every one of these, however, there are many more for whom the rewards of iris hybridizing have been spiritual, not financial.

To the usual rich pleasures of working in the garden in the morning sunlight, smelling the moist earth after a rain, and discovering a new green shoot on a plant given up for lost, add the exciting anticipation when the long-awaited bud starts to open to show you the offspring of the parents you have chosen—and you have the explanation for the increasing number of amateur iris hybridizers.

IRIS COMPANIONS

By MOLLY PRICE

Mrs. (John M.) Price writes articles for magazines and newspapers, and recently completed a book about the iris she grows in her garden in New City, Rockland County, New York. Here are excerpts from the chapter, "In the Garden Picture," of *The Iris Book,* published in March, 1966, by D. Van Nostrand Company, Inc.

FOR COMPANIONABLE BLOOM at iris time, bleeding-hearts *(Dicentra spectabilis)* and Siberian bugloss *(Brunnera macrophylla)* are most faithful. The bugloss, unrivaled for true-blue color and the beauty of its large, heart-shaped leaves, is perhaps number one on my list. First flowers open with daffodils and the tiny, bearded pumila irises, and bloom continues through the late tall bearded iris season—a notable performance. The bleeding-heart blooms almost as long. These two are indispensable as background for the ten- to fifteen-inch high, standard dwarf irises and the slightly taller, slightly later intermediates, both of which combine well with Darwin and lily-flowered tulips.

In a perennial border very tall varieties of bearded, Spuria, Japanese, and Sibirian irises make a fine background for shorter perennials. Shorter varieties of all these may form the middle-ground masses. Groups of bulbous Dutch and Spanish types belong toward the front of the middle section, and the standard dwarf bearded and some species, such as *Iris tectorum* and *I. aphylla,* serve as accents in the foreground. Miniature dwarf bearded irises and the tiny, spreading *I. cristata* are effective as irregular drifts.

In one large, raised, predominantly tall bearded border adjacent to our house I planted, for early bloom, a forsythia which I keep pruned fairly flat against the wall. Beneath it I drifted a selection of early bulbs. First to come are the little, narrow-petaled, bulbous reticulata irises which mingle rich violet, blue-purple, and yellow. A hundred or more of these four-inch irises, combined with snowdrops and accented with *Tulipa kaufmanniana,* occupy little space and make an unforgettable picture. Then in April come Juno irises, a few large, white and yellow daffodils, blue hyacinths, and tiny, blue-striped *Puschkinia libanotica,* followed by the fragrant *Narcissus jonquilla simplex.* All have finished blooming by the time the bearded iris fans in front of them have grown tall enough to hide their postbloom untidiness. The bed is edged irregularly with two varieties of perennial candytuft (one blooming earlier than the other) and accented by a clump of the blue parrot tulip, another of a violet Darwin tulip, three bulbs of the yellow parrot tulip, some miniature daffodil species, and a few standard dwarf bearded irises which are followed by the beautiful oncobreds, earliest of my big irises. While these are flowering, the tall bearded fans, growing greener and spikier every day, begin to send up bloom stalks.

At one time or another almost all late May- and early June-blooming perennials have been suggested for grouping with tall bearded irises. Peonies, Oriental poppies, and lupines are the large-flowered plants most frequently used. Self-colored lupines are to be preferred: some of the bicolors are harsh. Among peonies, I prefer single-flowered varieties. Double peonies are so huge that they dominate even the largest tall bearded irises if the two bloom at the same time. Oriental poppies, though large, are not so overpowering, and the foliage has the valuable habit of dying down shortly after the blooming period is over which permits the irises to ripen their rhizomes in full sun.

If only a few tall bearded plants are used for color and mass in a varied planting, it is wise to arrange the design so small-leaved plants will be closest to the irises. Coral-bells and columbines cannot be surpassed as iris

Perennial candytuft and columbines are pleasing companions for tall bearded irises.

companions. Though many gardeners find mixed colors of the latter delightful, to simplify problems of color combination I grow only blue columbines.

Dianthus, either the many species which can be grown from seed or named cultivars, such as the coral-rose 'Pink Princess', are satisfying front-of-the-border companions. So are the veronicas. The gray-leaved, purple-blue-flowered *Veronica incana* and the taller, gentian-blue-flowered *V. latifolia* are my favorites. An irregular clump of the latter spilling brilliant blue over the edge of the border makes an effective accent. I particularly like the combination of blue and clear yellow irises with the perennial poppy, *Papaver atlanticum,* which has medium-sized, pale orange flowers on tall, thin stems.

For later color, tender bulbs of slender habit, such as acidanthera and the miniature gladiolus, may be planted between iris clumps. *Aster frikarti,* which blooms from June to frost, and that long-flowering and exceptionally beautiful white phlox 'Miss Lingard' are excellent choices, too.

In the all-iris border, nearly always of the popular tall bearded varieties, background becomes highly important for both the flowering and postbloom periods. Gardeners must take care to avoid a stiffly regimented effect. A shrub border provides the most usual and one of the loveliest of backgrounds, especially if it can be seen from a distance or can be planted in a wide curve.

A coniferous evergreen hedge, dark green and black-shadowed, is dramatic and formal, but the shiny-leaved, light-reflecting hollies and large-flowered, broad-leaved evergreens which bloom at the same time as the tall bearded irises detract from rather than enhance the beauty of the iris flower—unless they are used as focal points in the distance.

When an informal border of deciduous flowering shrubs is used, the effectiveness is greatly increased if the grouping is irregular enough to provide little bays and peninsulas. For this kind of background I should choose a high proportion of plants which come into flower either before or after the irises bloom — and which offer berries and colorful foliage in the fall — and let the irises dominate the garden in their season.

The gardener who prefers a flowery background for his irises may well include shrubs with small white flow-

(Continued on page 107)

A stone wall is an attractive background for irises, peonies, and other perennials.

THE PASQUE-FLOWERS

By H. LINCOLN FOSTER

While Mr. Foster spent most of his professional life as a teacher of English and Latin, his consuming interest has always been gardening. Since his retirement, he and his wife, Laura Louise, have devoted their entire time to tending their own beautiful garden in Falls Village, Connecticut, in making gardens for others, in writing about gardens and the plants they especially enjoy—rock and alpine plants, wild flowers, ferns, azaleas and rhododendrons—and in collecting plants here in the East and in the Pacific Northwest. Mr. and Mrs. Foster are trustees of the Root Glen Foundation in Clinton, New York, and members of the American Rock Garden Society. Mr. Foster is the President of the latter organization.

THE CUPS OF OPALESCENT COLOR arise early from the sodden spring ground, the sepals expanding in the clear sunshine and cool air to reveal a golden filigree-ball of pollen-laden stamens and the fine tasseled brush of anthers. By night or when the gray clouds erase the sun, the colored sepals close, wrapped then in the silky garment that backs the outer circle as they fold inward. The short flower-stems at this stage of their development are likewise clothed in glistening silky hairs.

These are the pasque-flowers, the pulsatillas. What a curious history is in the name! Originally *Passe Fleur,* an early French name for the anemone, it first became Pasque in the writings of the early herbalist Gerarde. For some fancied reason he related it to the word Pasch, the Jewish Passover, and from thence to the Christian Easter. And how appropriately these strange linguistic modifications invest the pulsatillas. By the very early season of their resurrection, they rhyme themselves with Easter. And, indeed, because of the brilliant purple of the commonest species, it became rumored that a dye for Easter eggs was extracted from the plant in early days. Charming and fitting as this legend is, there is no evidence that the color can be extracted, much less transferred to the shell of an egg.[1] The only color actually to be derived from them is a faint and impermanent green.

It must be confessed that as the fat, furry buds stand closed at first on their short stems and the glow of the purple color flashes out, they do look like swaddled Easter eggs. That the type-species, *Pulsatilla vulgaris (Anemone pulsatilla),* is found in England, and most often in the area of Roman occupation activities, led Reginald Farrer to proclaim: "The Romans probably brought it into England in their train, and it produces a beautiful green dye, which has earned the plants its English name of Pasque-flower, because it was used for staining the Easter eggs. And now on Roman works, such as the Devil's Dyke near Newmarket, its lovely great violet starry cups with the golden tassel at their heart lie thick upon the sere ground under the wild skies of March, before the little silky ferny foliage on which they sit so close at flower-time has fully developed its leaflets."

Beneath Mr. Farrer's vivid and breathless prose and the sharp eye with which he saw the flower itself, there

Pulsatilla patens nuttaliana.

is an amazing bit of mystification. One is led to suppose that the Roman Legions carried with them during the occupation of the isle either the seed or roots of the purple anemone from home so that they might dye their Easter eggs. They had but to recall from early attempts to conquer Britain that the faces of their savage antagonists were stained with an abiding deep blue color from the plant we now know as woad. From this they could have dyed more clearly their eggs, if in fact they dyed any eggs at all.

That the pasque-flower exists in England on Roman earthworks is perhaps more easily to be explained in rather unromatic ecological terms: pulsatilla grows in well-drained, rocky soil.

The *Pulsatilla* has a wide, if somewhat spotty distribution in the world. There are a number of species, subspecies, and named forms of this genus, only recently recognized by gardeners as distinct from *Anemone*. The separation is based principally on the character of the seed-head, which, as in all the *Anemone* tribe, is composed of a cluster of one-seeded achenes and in the case of *Pulsatilla* forms a fluffy ball as the feathery styles elongate. This seed-head is an added decoration in the garden after the fading of the flowers. The large and colorful blossoms are composed of six petal-like sepals, in bud wrapped in furry, pointed, involucral leaves which later form a green, flaring petticoat-ruff beneath

1. Since exploring this idea through many references, I have just read in the *Bulletin of the American Rock Garden Society* (January, 1966) an article by a Czech who writes: "In the eastern part of our country, in semimountainous areas of Slovakia, some widely spread species are deep-violet, so deep that village people use this plant for painting of boiled eggs, which is an old custom for the celebration of Easter holidays. (They boil eggs in peels of onion to paint them yellow and rust, in green-rye to make them green and in flowers of Palsatilla to paint them blue and violet.)" What is one to say?

the flower on the elongating stem.

As indicated, these plants are of wide distribution with the greatest concentration and greatest variation in middle and eastern Europe, and at least one species in China and two in North America. The species may be grouped for garden purposes into four types represented by a typical species in each: *P. alpina, P. pratensis, P. vernalis,* and *P. vulgaris.*

Pulsatilla alpina is one of the glories of the European Alps, not at the highest levels but in those marvelous high meadows which bask briefly in the clear summer sun and are rich with a sward of flowers and thin grass subtly mixed, the air filled with the sounds of musical cowbells, the whistle of marmots, and the play of wind among the pinnacles above. There in the drier, rockier reaches arise a whole dancing company of clear white chalices above the tenderly opening tufts of carrot-like foliage. The aged, fat-rooted clumps produce a dense cluster of stems topped with solitary, white blossoms, tinged smokily with blue or pink upon the back of the sepals. In some regions of the far-ranging mountains the whole company assumes a sun-clear sulphur hue; such is var. *sulphurea,* true-breeding from the feather-tailed seeds, quickly shed and in this variety ever sparingly produced, and, as in all pulsatillas, quickly deprived of their generative force.

This is not an easy plant to establish in gardens. The tough taproots, generally tightly wedged in cracks of the solid rock or buried deep in a tumble of chunky blocks, are almost impossible to dislodge complete. Seed, except when strictly fresh, is, alas, even more reluctant to germinate than in others of the tribe. And if perchance promising seedlings are finally produced, they are slow to reach flowering maturity, sometimes taking as long as five years. Once established, however, in an open, well-drained, rocky site with ample humus for sustenance, the plants will live to a Methusalan age, upsurging in early spring year after year in an ever-increasing sheaf of flowering stems, bursting with two- to two-and-a-half-inch blossoms. The furry buds may begin to unfurl when the stems are only four inches above the moist spring soil, to be carried aloft as they open and fade, until, when the fluffy ball of the seed-head is turning to a golden-brown, they may stand sixteen inches above the fine-cut clump of foliage.

Similar to it and with flowers only slightly smaller but always white is the American *P. occidentalis* of high, open, rocky places in the Cascade and Rocky Mountains. At such elevations it is generally July before this pasque-flower begins to raise glistening cups above the melting snow. By late August the basal foliage is a foot-high mound of finely divided carrot-foliage and above it the drumstick-like heads of seed with furry tails. In this species the seed-heads are not spherical and upstanding, but generally more elongate like a carelessly brushed busby. As with its European counterpart, this species is intolerant of transplanting, slow from seed, and precise in its demands: sun, drainage, moisture in spring, and an acid, rocky soil. *P. alpina* tolerates and may even crave lime in the soil.

The second cluster of species within the genus is less glamorous, but no less beautiful. Among this group, like *P. pratensis,* are those with a shyer and more nodding disposition; but, as with many shy natures, their colors run deep. *P. pratensis* itself has the characteristic slashed foliage of the genus and when the great dandelion-head of seeds is held erect on sixteen- to twenty-four-inch stems, it is difficult to distinguish from sibling species. The flowers are, however, markedly different. They are completely nodding as they first open their deeply colored bells; slowly they raise their heads revealing in the bonnet, with its reflexed sepal-lobes, the gleaming tassel of the expectant purple stigmas surrounded by golden stamens, clapper-like within the bell. As they are lifted upward the sepals splay outward in a starry pattern and fade thus about the erect touseled head of seeds. *P. pratensis* is wine-dark in color with a precocious down of ancient gray hairs bearding the backs of the petal-like sepals. In var. *nigricans* the color takes on even deeper midnight shades, rich purple-black as a glistening equatorial skin or a ripe and succulent Concord grape.

In this group reside bright violet *P. regeliana* with widely campanulate flowers; eastern European *P. albana,* which runs off into curious shades of red and bleeding white; very early, purple *P. armena;* and the widespread *P. montana,* so variable in color and shape

Pulsatilla wahlenbergii.

Pulsatilla halleri subsp. *slavica.*

as to swallow up all the botanical distinctions within this nodding fraternity, of which it is, perhaps, the ancestral matriarch.

In the third group *P. vernalis* stands alone except, perhaps, for the shy *P. cernua* of Japan. It stands alone botanically, because the foliage clump of tightly interwoven, wedge-shaped, divided leaves is evergreen and only sparsely hairy. This pulsatilla stands apart more conspicuously, however, because of the ethereal beauty of her ravishing flowers and for her home among the highest glacial scree-beds in the lofty Alps of Europe. There it reflects in the mysterious inner glow of its stained-glass sepals the myriad colors of the sun in an ice cave, reflected pinks and pale lavenders, all smoky with the glint of golden threadlike hairs, a Damascus cloth. No wonder it is called in the various tongues of Catholic Europe—Our Lady of the Snows.

The pasque-flower of the belated alpine spring, *P. vernalis,* comfortingly and with early benediction descends into the gardens of those who will prepare a fitting home. In a deep pocket of rocky soil, laced and enriched with moisture-holding humus, open to the air and sun of heaven, but never parched, it unfolds amidst a stalwart cushion of firm, evergreen leaves the delicately tinted white flowers. They are swaddled and wrought with a protecting sheath of gentle, golden hairs, proof even against the cruel late frosts and snows of April. It is as shy as it is sweet, rarely blooming until four years from seed, and even when mature frequently too daring, pushing the furred buds in late autumn after a sequence of cold weather followed by warm days. With patience, however, the grower is finally rewarded by a kind of resigned acceptance in the full-grown plant. Youthful exuberance is stilled; the blossom-buds, always prepared in fall and nestled in the shelter of the plated foliage, finally restrain themselves till the rapid changes of the fickle spring have steadied. Then when the air is yet cool and the spring sun sharp, the silk-wrapped buds slowly unfold on elongating, furry stems.

The fourth riotous group is rich and sumptuous, easy, flaunting, and unabashed. This is the group which, despite the botanists' divisions and specific separations, might be lumped under the species *P. vulgaris.* Here, quite reasonably, might be embraced *P. patens* of Europe and its American offshoot, *P. hirsutissima,* also *P. halleri* and all those glorious subspecies and forms so common in middle and eastern Europe—*P. slavika, P. caucasica, P. gothlandica, P. gayeri, P. wolhynia,* 'Van der Elst', and 'Budahpest'. There is no fairer description of them all than that penned by the man who on a whim first coined the name pasque-flower—Gerard.

In his sixteenth-century herbal, he noted the difference from the anemone and denominated the pulsatilla, bastard anemone, a separation which modern botanists accept in their designation as a different genus—pushing Linnaeus now into a parenthesis after the name. Gerard, in his Herbal, delineated this rare English native of the chalk downs thus:

"The first of these Pasque floures hath many small leaves finely cut or jagged, like those of Carrots: among which rise up naked stalks, rough and hairie; where

Upper. *Pulsatilla vulgaris alba.*
Lower. *Pulsatilla patens.*

upon doe grow beautiful floures bell fashion, of a bright delaied purple colour: in the bottome whereof groweth a tuft of yellow thrums, and in the middle of the thrums it thrusteth forth a small purple pointell; when the whole fleure is past there succedeth an head or knot compact of many hairy lockes, and in the sollid parts of the knobs lieth the seed flat and hoary, every seed having his own small haire hanging at it. . . .

"The white Passe floure hath many fine jagged leaves, closely couched or thrust together, which resemble an Holy-water sprinckle. . . .

"They floure for the most part about Easter, which hath mooved mee to name it Pasque-Floure or Easter floure. . . . In Cambridge-shire where they grow, they are named Coventrie bels.

"There is nothing extant in writing among Authors of any peculiar vertue, but they serve onely for the adorning of gardens and garlands, being floures of great beautie."

They are, indeed, "floures of great beautie," none greater. And what recommends them, at least those of the *P. pratensis* and *P. vulgaris* sections, is their accommodating nature. They are simplicity itself to grow, and their iron constitution assures that, given the proper

home, they will produce year by year their early offering of flamboyant flowers and the delightful tousled head of seeds in summer. The thick, fleshy roots run deep in the open, well-drained, sweet soil. Only in youth do they transplant easily, yet pieces of root wrenched from beneath the crown can be induced, if taken after flowering, to produce a new plant when treated as a cutting in a medium of sand.

It is easiest, perhaps, to grow them from seed, provided always that the seed is really *fresh*. If the seed is collected about the end of July (when the achenes, clustered in a tight ball at the base of the fluffy head, are swollen and begin to change from green to brown) and sowed immediately in a well-drained, sandy soil-mixture, young plants will be produced with two or three sets of true leaves by winter. The seed is probably best sowed in a flat or other container which is kept shaded and moist until the seed germinates. The seedlings should be transplanted the following spring and should begin to bloom the succeeding year.

If the feathery tails are left on the seeds, they will spiral and curl as if alive when sprinkled with water. This is a mechanism perhaps designed to corkscrew the seeds into the ground, but may as easily work them upward when the tails are partly buried. If the seeds and tails are covered by about one quarter of an inch of fine gravel, they will stay buried; or the tails may be cut off for easier sowing.

Seed collected from pure white forms of *P. vulgaris* will generally come true, while those from pink- or red-flowered forms will give an interesting lot of seedlings of various shades.

The American pasque-flower, *P. patens nuttalliana (P. hirsutissima),* is one of the most beautiful of all, the flowers being larger and more delicately colored than any of the *P. vulgaris* group in Europe. The great cups, up to four inches across, are a pale opalescent lavender, nacreous in texture, and the outside of the sepals downy with gleaming silver hairs. This lovely American wildling flowers in early spring from the Mississippi River westward to the foothills of the Cascades and on into Alaska. A plant of rocky pastures and upland meadows and of sunny glades, it is known locally as May-flower or wild crocus. Given a well-drained, rich, deep soil in full sun, year by year the plant will increase its yield of stunning goblets.

MONTICELLO

By DOROTHY EBEL HANSELL

MONTICELLO COMMANDS a panorama of an extensive valley and several mountains. I had enjoyed this magnificent view in springtime five years ago and looked forward to seeing it in spectacular fall color in 1965. The color was there — the Smokies and Blue Ridge Mountains through which I traveled were at their best— but dense mist, then heavy rain completely concealed all color from sight at Monticello.

This article on Monticello and Thomas Jefferson's great interest in and affection for his beautiful estate and its plants is based on notes I accumulated during my several visits there, on literature furnished by the Thomas Jefferson Memorial Foundation and the Garden Club of Virginia, and on information gleaned from *Thomas Jefferson's Garden Book* annotated by Edwin Morris Betts and published by the American Philosophical Society.

A great naturalist with an alert and observant eye, a lawyer by profession, an architect by choice with an aptitude for inventing major and minor contrivances to aid in the operation of his estate indoors and outdoors — this is the man who served his state of Virginia as Governor, his country as Secretary of State in Washington's cabinet, as Minister Plenipotentiary to France (1784-1789), as Vice President under John Adams, and as President; who was President of the American Philosophical Society (1797-1814); and who founded the University of Virginia.

Thomas Jefferson recognized and was proud of his accomplishments as lawyer and statesman, especially proud of his part in drafting the Declaration of Independence and in founding the University of Virginia. But his real pride of accomplishment, and enjoyment as well, was in planning and developing Monticello. For Jefferson loved growing things.

He deeply appreciated the naming of a plant, originally called *Podophyllum diphyllum, "Jeffersonia* in honour of Thomas Jefferson, Esq., Secretary of State to the United States." Benjamin Smith Barton in the paper that he read before the American Philosophical Society on May 18, 1793, stated, "I beg leave to observe to you, in this place, that in imposing upon this genus the name of Mr. Jefferson, I have had no reference to his political character or to his reputation for general science and literature. My business was knowledge of natural history. In the various departments of this science, but especially in botany and zoology, the information of this gentleman is equalled by that of few persons in the United States."

Fifteen years later Jefferson himself planted *Jeffersonia binata,* now *J. diphylla* (L.) Pers., in an oval bed at Monticello.

His interest in plants and gardens began when he and his sister wandered over the meadows and hills of the family home at Shadwell, Virginia. Nine months after Shadwell burned, Jefferson moved to Monticello — in November, 1770. He had already contracted to have the top of the mountain leveled, on which his home was to be erected; had drawn up specifications for the mansion and other buildings; had planned and planted some

areas several years before taking up occupancy. The mansion, one of the classic examples of American architecture, was not completed until 1809, thirty-one years after the initial construction. Some of its features — skylights, storm-windows, turn-around dumb waiter, automatic opening and shutting of a large glass door, all evidences of his ingenuity — were far in advance of his day.

The site on which Jefferson created his estate was over eight hundred and fifty feet above sea level. (The

land grant of one thousand acres to Peter Jefferson, dated 1735, passed to Thomas Jefferson at the death of his father in 1757.) Jefferson made the mountain site accessible by constructing "round-abouts" — paths at four different levels on its slopes. He drew plans for the lawns and gardens on the east and west sides; the dome dominates the garden on the west. However, because of his long absences — in Williamsburg, in France, in Washington — it was not until the late years of his life that the gardens were completed.

In a letter (1806) to William Hamilton, Jefferson wrote, "Having decisively made up my mind for retirement at the end of my present term, my views and attention are all turned homewards. I have hitherto been engaged in my buildings which will be finished in the course of the present year. The improvement of my grounds has been reserved for my occupation on my return home."

To another friend he wrote, "Never did a prisoner released from chains feel such relief as I shall in shaking off the shackles of power. Nature intended me for the tranquil pursuits of science, by rendering them my supreme delight . . ."

In April 1807 he planted the circular and oval flower beds on the east and west lawns with perennials, shrubs, and trees. Among the latter were purple beeches, mountain-ash, paper mulberries, and robinias. The next year he built the serpentine round-about walk on each side of which were beds of flowers and shrubs. Subsequently, there was bloom at Monticello with bulbs, perennials, and shrubs from early spring till late winter.

Some years later his granddaughter, Ellen Randolph Coolidge, in a letter to Henry S. Randall revealed Jefferson's delight in his garden, in which he walked every day immediately after an early breakfast. "One of my early recollections is of the attention which he paid to his flower-beds . . . I was too young to aid him, except in a small way, but my sister, Mrs. Bankhead, then a young and beautiful woman, . . . was his active and useful assistant. I remember the planting of the first hyacinths and tulips . . . There was Marcus Aurelius and the King of the Gold Mine, the Roman Empress, and the Queen of the Amazons, Psyche, the God of Love, etc., etc. . . . Then, when spring returned, how eagerly we watched the first appearance of the shoots above ground . . . Then, when the flowers were in bloom, and we were in ecstacies over the rich purple and crimson, or pure white, or delicate lilac, or pale yellow of the blossoms, how he would sympathize in our admiration or discuss with my mother and elder sister new groupings and combinations and contrasts. Oh, these were happy moments for us and for him."

In 1808, the old vegetable garden on the southern side of the mountain was leveled and remade with eighteen beds of various sizes; the number of beds was increased to twenty-four several years later. Instructions in his farm and garden books show how carefully Jefferson thought out and planned the work. "Because of the prodigious mass of earth," which would have had to be dug and carried some distance, Jefferson proposed to "have the garden done in four different levels of 250 f. length, from East to West, having done one of them, a second should be measured off and a new level assumed for that so that the earth to be dug away from what is too high shall fill up that part which is too low . . ."

He also built a fish pond as a decorative part of the flower garden, but its uses were primarily to conserve water and to keep fish fresh until wanted for the table. Refrigeration was unheard of in those days.

The gardens were restored in 1939-1941 by the Garden Club of Virginia, according to Jefferson's original plans and only those plants on the lists in his garden and farm books were used in the replanting.

Some flowers and shrubs which are associated with Virginia gardens, and notably boxwood and crape-myrtle, are not to be seen at Monticello, for Jefferson did not grow them. But in addition to the wealth of native plants, he grew many exotics which he obtained while he resided in France or from different sources in this country.

He also introduced American plants to French gardens, writing to friends, when he was abroad, to send him seeds or cuttings. One of the friends to whom he appealed was John Bartram, Jr. In a letter to Bartram, dated Paris, 1786, Jefferson requested over fifty different kinds of plants: among them, *Ceanothus americana, Chionanthus virginiana, Clethra, Diospyros virginiana, Gleditsia triacanthos, Juglans nigra, Kalmia angustifolia* and *K. latifolia, Liquidambar styraciflua, Liriodendron tulipifera, Magnolia acuminata, M. grandiflora, M. glauca,* and *M. tripetala, Quercus phellos* and *Q. virginiana,* and *Rhododendron maximum.* Quite an order, considering that communication and transportation facilities were not as rapid nor as convenient in the eighteenth century as they are in the twentieth.

Jefferson, of course, planted not only ornamentals, but vegetables, herbs and fruits, as did Washington at Mount Vernon. These were essential for the family's supply of food. He had quite a selection of fruits — apples, apricots, peaches, pears, plums, cherries, figs, pomegranates, grapes—and a variety of berries, and also nuts — almonds, black and white walnuts, hickory or pignuts, chestnuts, pecans. He also raised other crops, some successfully, some not so, such as mountain rice, wheat, rye, flax, hemp, and bene or *Sesamum trifoliatum.* Seeds of the latter, brought by African negroes to South Carolina and Georgia, yielded an oil for salads. Jefferson considered it an "excellent substitute for olive oil."

Peas were Jefferson's favorite vegetable, and there are numerous references to sowing seeds of peas and to different varieties, such as 'Spanish Morotto', 'Forwardest', 'Middling', 'Charleton', and 'Hotspur'.

"Peas of March 17 appeared above ground on April 1. They came to the table on May 28, a total of 73 days from time of planting to eating.

" 'Forwardest' peas, planted on February 20, came up March 9; they were ready for the table on April 24, a total of 64 days from planting to eating."

There was lively competition to have the earliest peas among the gentry in the Charlottesville area.

(Continued on page 107)

A NOSEGAY OF WILD FLOWERS FROM A NORTHWESTERN TREK

By HELEN D. CARSWELL

Mrs. Carswell is active in the Horticultural Society of San Fernando Valley, and native plants, herbs, irises, and roses are among her interests. She was president of the San Fernando Valley Rose Society last year, is nationally known as a rose judge, and is a consulting rosarian for the western division of the American Rose Society. The following is based on her article, under this title, that was published in *California Garden,* February-March, 1965.

Sego-lily, *Calochortus nuttallii.*

I WAS DETERMINED, even as a toddler, to see the wild flowers in spring and begged my uncle, not much older than I, to carry me across the swamps on my grandmother's farm to where the first violets of the year made their appearance. This determination has continued to prevail every spring, and in spring 1964 finding and seeing the glacier-lily, *Erythronium grandiflorum,* and the bear-grass, *Xerophyllum tenax,* were my objectives. I found and saw them; and while doing so, in a little, old bookshop, I picked up a used 1916 edition of *Through Glacier Park* by Mary Roberts Rinehart.

It was an account of a three-hundred-mile trek across the Rocky Mountains on horseback, made by forty-two people. The party included Charles M. Russell, the cowboy artist whose painting "Jerked Down" was adapted for a United States postage stamp in the Fine Arts Series of 1964. This book stirred in me a longing to return to Glacier, even though the author never "saw" a wild flower on the trip. However, for me, the 1964 spring had some delightful wild flower surprises.

Let me bring you a nosegay of the flowers I found on my travels . . .

The Pacific Northwest District of the American Rose Society, with the Missoula Rose Society of Montana serving as host, gave three rosarians an invitation to judge the District's rose show. Our journey took us through several states and the Province of Alberta, Canoda; and, like the "Men of Hindustani who went to see the elephant," we all "saw" different things.

Fortunately many plants came into bloom at least a month late that spring, and so with these late bloomers and the ones on regular schedule there was a wealth of color everywhere. Reuben A. Diettert, Professor of Botany at Montana State University, recommended (The Peterson Field Guide Series) *A Field Guide to Rocky Mountain Flowers* by John J. Craighead, Frank Craighead, Jr. and Ray J. Davis, for the area we visited. . . .

Several of us had treked one year to look at a whole mountainside of bitter-root in bloom. Alas! no one had noted that the flowers close in the late afternoon, and we had to content ourselves with the sunset view of the city and its mountain background. So you can understand why the highlight of the trip in 1964 was my first sight of bitter-root, *Lewisis rediviva*—not, however, in its native habitat but in a rosarian's garden.

Every school child has read Lewis and Clark's account of their rigorous 1805-1806 expedition across the unmapped country from St. Louis to the Pacific Ocean. In what is now Montana they found the Flathead Indian women digging roots, which looked something like parsnips, for food. Some of the specimens of this plant, which Lewis collected, reached the botanist Frederick Pursh, and he named it *Lewisia* in honor of the explorer. The specific epithet *rediviva* was chosen because the dry herbarium specimens came to life when they were planted.

To appreciate the haunting beauty of the bitter-root, one has to see the living, exquisite, soft pink flower, to study the artistry of its petal arrangement. Can you picture me down on my knees, taking a close-up of the little blooms?

From Missoula we drove along Flathead Lake to Glacier. While my companions looked for pine cones and pebbles to use in flower arrangements, I sought and found the twin flower, *Linnaea borealis,* a trailing evergreen subshrub with tiny, bell-shaped flowers of delicate pink. This member of the Honeysuckle Family is named for Karl von Linne or Linnaeus, as he is generally called. One of the great botanists of the world, he devised the binomial system of plant classification. . . . Linnaeus succumbed to the charms of this shy woodland plant on a visit to Lapland. Usually it grows in deep shade, but this time I located a little patch of matted, creeping stems in full afternoon sunlight. As I took several close-ups of the slender stalks, each with its drooping bells, I thought of Emerson's lines:

He saw beneath dim aisles, in odorous beds
The slight Linnaea hang its twin-borne heads
And blessed the monument of the man of flowers
Which breathes his sweet fame through the northern bowers.

Another flower I bring to you is the queen-cup, *Clintonia uniflora,* of the Lily Family. This I came upon as, again on my knees, I was photographing the creamy white spikes of the bear-grass, *Xerophyllum tenax.* In a partially opened state, the heads of the bear-grass resemble little sombreros, especially when one is looking up at them from ground level.

The pure white flower of the queen-cup is carried on a fragile, slender stalk. It was easily identified as *C. uniflora* from the description and clear picture in Craighead's book.

While it would have been delightful to have lingered in Glacier, we had a date across the Canadian border in Alberta. I often dream of spending whole seasons at my

Bitter-root, *Lewisia rediviva.*

Bear-grass, *Xerophyllum tenax.*

sister's cabin on Lake Beauvais, a Provincial Park rich in wild flowers. From its vast treasures I bring you just two which were blooming in profusion during our visit —the long-plumed avens, *Geum triflorum,* and the red lily or prairie lily, *Lilium umbellatum.*

I found the red-stemmed, drooping, pinkish flowers of the avens (actually the flowers hang downward because the stems bend) growing in swampy water below a beaver dam at the end of the lake. The three pink flowers on each stem never fully open. Growing nearby, but on higher ground, were plants with similar foliage on erect stems, but only one flower to a stem. These were in seed but must have bloomed in great numbers earlier in the season. (Later I identified it as *G. rossii.*)

The weekend magazine of the local Sunday newspaper featured ten local wild flowers in color. From it I learned that the red lily or prairie lily is Saskatchewan's floral emblem.

At the local post office I found that Canada had started a series of flower stamps featuring the floral emblem of each province. The two already issued are the white trillium of Ontario and the fleur-de-lis of Quebec. I am looking forward to the issue bearing the red lily of Saskatchewan and especially to the one of the wild rose of Alberta.

Red or prairie lily, *Lilium umbellatum.*

Glacier-lily, *Erythronium grandiflorum.*

I wanted to linger and study the prairie plants, but we were headed for Watertown Lakes National Park—and there we found even more wild flowers. There is a fine display at Red Rock Canyon along what is known as Balkiston Falls Nature Trail. Representatives are grown in natural settings, in rocky nooks on the banks of the stream. All the plants are clearly labeled. I was delighted with a dainty calochortus—but it really belongs to Utah and is its state flower.

From Yellowstone I bring you the yellow water-lily, *Nuphar,* and the Indian paint-brush, *Castilleja lineariaefolia.* The large, floating leaves of the water-lily make interesting reflections, mingled with the pines in the background. My pictures show a closed, cupped bloom as do the postcards and the color plates in *The Plants of Yellowstone National Park* by McDougall and Baggley. Perhaps with enough time and the patience of a bird-watcher, one might find a bright day in the right season at the right hour when this flower would be open.

The Indian paint-brush is considered to be one of the most striking of the wild flowers in the Rockies. After finding it in white and cream on the shores of Upper Saint Mary Lake, yellow and orange elsewhere, and even a pretty pink, it was good to see Yellowstone's

Upper left. Lake Beauvais in Alberta, Canada.

Upper right. Lake MacDonald on Going-to-the-Sun Highway.

Lower right. "Spires of the Tetons pierce the Wyoming Sky." Flower meadows in foreground.

vivid clumps of *C. lineariaefolia* in a true warmer color, a brilliant, vivid red.

A friend's comfortable mountain home near the "Prehistoric Mystery, the Medicine Wheel" was the site of our next visit. The meadows at an elevation of ninety-nine hundred feet were a riot of intense color, the tiny jewel-like flowers blooming and reproducing their kinds freely. I have seen a shooting-star, *Dodecatheon vulgare (pauciflorum),* with umbels of lavender flowers, growing waist high in Sequoia's Crescent Meadow. In the alpine conditions on the top of Big Horn, another shooting-star, *D. alpinum,* produces a little stalk, about four inches high, with only one scarlet-red flower.

In a crowded clump was the second thrill of the trip —the wild crocus or pasque flower, *Pulsatilla vulgaris (Anemone pulsatilla).* The inside of the open bloom is a sparkling, waxy white set off by radiant yellow stamens. It grows singly, held up high. Something about the hairy stems "rang a bell." It came to me—the plant in seed at Lake Beauvais and this are one and the same. The pasque flower is the first to appear on the prairies even in the snows of March. Photographing them as they swayed in the breeze reminded me that the common name of the genus *Anemone* is windflower.

Perhaps the most conspicuous flower in the showy meadows of Grand Teton National Park, with spectacular background of lofty mountain peaks, is the scarlet gilia, *G. aggregata,* also known as skyrocket and fox-fire. Its brilliant red, trumpet-shaped flowers are borne in a long thryse (panicle).

The second flower from these mountains for the nosegay is not showy, just appealing—the harebell or bluebell of Scotland, *Campanula rotundifolia.* One would think that the drenching rain of the previous night would have shattered the fragile-looking, brilliant blue bells. But the loose racemes bow in the rain and lift up in the morning sun. From this you may deduce that they are tough enough to be walked on, as it says in Walter Scott's *Lady of the Lake.*

E'n the light hairbell raised its head
Elastic from her airy tread.

From Bryce Canyon I add the sego-lily, *Calochortus nuttallii,* to the nosegay of wild flowers. It was named for Professor Nuttall of Harvard who was with Richard Henry Dana *(Two Years Before the Mast)* on the return voyage to Boston in 1837. Most Californians know it as the mariposa-lily, the name given it by the Spanish because the open, spotted flower resembles a butterfly or mariposa. The Utah name, sego-lily, is said to be of Shoshonea origin. Pioneers in that state ate the bulbs to eke out their meager supply of food. The specimens in Bryce Canyon were almost white, with purple markings.

One more flower—the blue columbine, *Aquilegia caerulea,* the state flower of Colorado. I found it at Zion growing right out of the rocks, on the ceiling of a cave. I also came upon its yellow, or deep cream form.

May the nosegay from a trip covering five thousand miles quicken visions of future springs colored with wild flowers which have been permitted to survive—to grow and bloom.

GARDENING WITH NATIVE FERNS

By F. Gordon Foster

Mr. Foster is a research scientist for Bell Laboratories. In his garden at Maplewood, New Jersey, he grows many ferns and other plants. He is the author of *The Gardener's Fern Book,* published by D. Van Nostrand Company, 1964.

Ferns are not newcomers in the garden plan; they are among our oldest perennial plants. Properly selected, they will do well in your garden as their habitats extend from the hot, steamy jungles to the cold, barren, arctic tundras.

With a little ingenuity, your small suburban plot can be transformed into a miniature woodland retreat. Gardens having an acre or two, often with venerable trees, brooks, boulders, occasional stumps, and rotting logs offer a challenge to the imagination.

The adage, "Think before you plant," also applies to fern gardens. A little knowledge and forethought not only make a better garden but save frustration and disappointment. Planting requirements differ with various ferns—some like highly acid, damp soil; others like neutral or slightly alkaline, well-drained soil; and fortunately some are indifferent.

Consider the growing nature of each species. Ferns whose leaves grow from crowns will stay where planted. Others are invasive spreaders and are definitely not suited for the small garden. Further classifying divides them into deciduous or evergreen groups. Lastly, size is a factor—whether your need is a hand-sized spleenwort for a rock garden niche or a tall cinnamon-fern to hide the barren undergrowth of a rhododendron.

Make your fern planting artistic by simulating a natural setting for each species. Avoid crowding. It is only when each plant has ample space that its full beauty can be appreciated. Medium-sized woodland ferns are most attractive when placed near pumpkin-sized, rough stones. Remember that some of the colorful woodland flowering plants can be placed among the ferns. Narcissus in variety bloom before the fern foliage is fully developed; later the ferns conceal the yellowing leaves of the bulb plants.

Ferns can be planted any time of the year, although fall causes less disruption to the garden. Before planting, prepare the place for the new addition. Many of our native ferns like a woodsy mulch. First dig a hole about two feet in diameter and a foot deep. Fill firmly with well-rotted compost of leaves, woodchips, and bark. A few potato-sized stones will improve the drainage and ventilation of the soil. Observe the planting depth; some ferns have shallow rhizomes or modified stems which grow slightly below the surface. Crown-forming ferns are best planted with their crowns just showing above ground.

Among our northeastern ferns there are about thirty-five species which, when properly planted, will do well in the garden. Limit your selection to plants which are rugged and less particular to soil and light conditions. Some grape-ferns require mycorrhiza, a fungal relationship, in association with their root systems, and are virtually impossible to grow in ordinary garden soil. Christmas-ferns, lady-ferns, osmundas, and shield-ferns readily adapt themselves to new locations and are attractive and lasting.

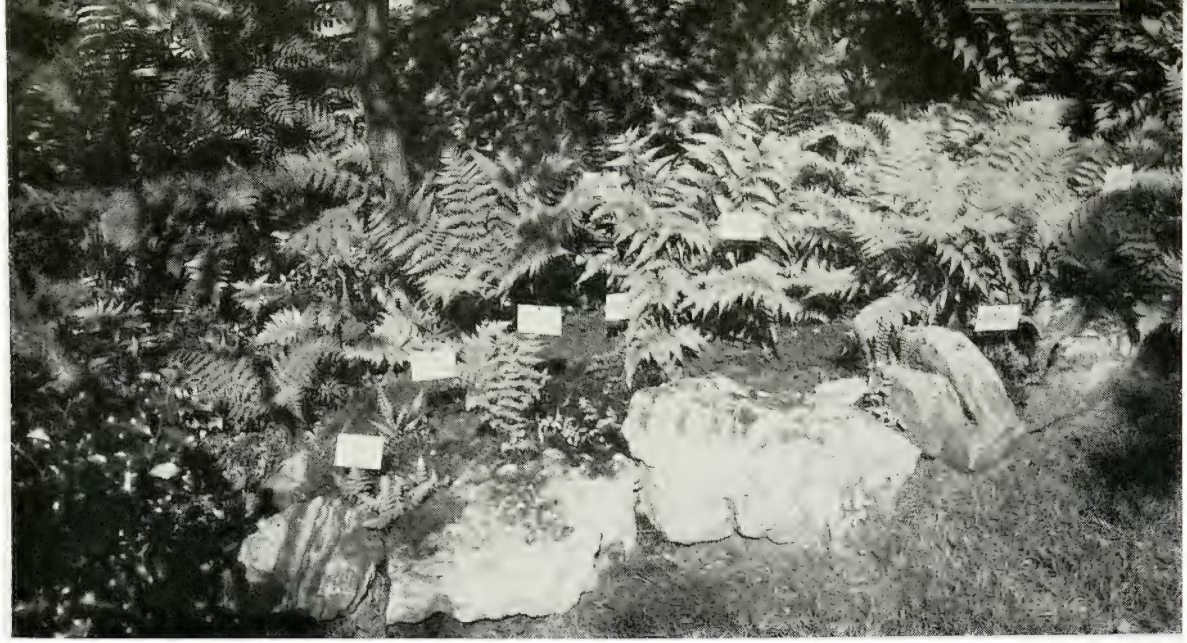
Here are a few suggestions for starting your fern garden. In this area there are three osmundas, *Osmunda cinnamomea,* the cinnamon-fern; *O. claytoniana,* the interrupted-fern; and *O. regalis,* var. *spectabilis,* the royal-fern. All are at home in wet, shady swamps, but with reasonable care will do well in drier soil. Their best use is for backgrounds in the small garden or for transitionals in larger areas. While growing to five feet in their native haunts, they seldom exceed thirty inches in a home garden. Cinnamon-ferns and interrupted-ferns are also useful as foundation plants, hiding unattractive brickwork. Royal-fern has a leaf similar to that of the locust tree and is excellent when planted individually. In nature, it grows along brooks and ponds; water it often during dry spells. Osmundas grow as clumps and are extremely slow in spreading. Their usual growing period is from mid-April to late September.

Goldie's-fern, *Dryopteris goldiana,* is also a woodland monarch and reaches forty-two to forty-eight inches in the garden. Also known as the giant wood-fern, this hearty fern turns brown about the first of October. It does best in rich humus; observe its crown when planting and keep the mulched soil damp at all times.

Other species of the genus *Dryopteris* blend well with Goldie's-fern. Since they are smaller, group them in front. All do best and look more natural growing beside large stones or rotting logs or stumps. *Dryopteris marginalis,* the marginal shield-fern, has a leathery, blue-green leaf and is fully evergreen even in the cold mountain climate of northern New York and Vermont. *Dryopteris spinulosa,* the spinulose shield-fern, and *D. intermedia,* the intermediate shield-fern, have more lacelike cuttings of the pinnae or leaflets. In this area these plants are both hardy evergreens. Commerically, their leaves are cut in August and held in cold storage for the winter floral trade. These *Dryopteris* ferns are crown-formers and will not spread.

Most beloved of all ferns is the common maidenhair, *Adiantum pedatum.* Delicate in appearance, it is hardy throughout our northern region. Its early croziers or fiddleheads of earth-matching reddish brown are seldom seen by most people. This fern, with its soft, gingko-like leaves, is only one of about one hundred and fifty different maidenhair species found throughout the world from the hot, damp tropics to the Aleutian Islands. For utmost beauty, plant it as an isolated clump among bleeding-heart or Dutchman's-breeches.

Christmas-fern, *Polystichum acrostichoides,* is one of our best evergreen ferns. Although essentially a crown-



Bold, hardy species in a raised corner garden. Ebony spleenwort, rusty woodsia, and purple cliff-brake hide among rock crevices.

former, it does spread slowly. It tolerates an impoverished soil, but will make a fine stand where well-mulched soil is provided. Christmas-fern leaves vary greatly in size and shades of green and darken with the coming of cold weather. The leaves finally flatten to form dense, soil-retaining mats which help to protect easily eroded slopes. This species is among the first to appear in spring and its growth is most rapid. When young, its rachises are not sufficiently rigid and the leaves assume a temporary wilted-appearance.

Lady-fern, *Athyrium filix-femina,* has long been the fern of the poets. The plant is condemned by some gardeners as being over aggressive. Control its spreading by planting it between the house and driveway. The plant is deciduous, but continues to send up new leaves until overtaken by frost.

Ostrich-fern, *Matteuccia struthiopteris* var. *pensylvanica,* is a beautiful species with large, stately, plumelike leaves. Because of its strong spreading tendencies, it should have no place in the small garden. It prefers wet locations; gardeners having brooks with erosion problems can take advantage of its vigorous, matted root system. It is up early in the spring, but becomes shabby by late August unless kept constantly moist.

New-York-fern, *Thelypteris novaboracensis,* and hay-scented-fern, *Dennstaedtia punctilobula,* plants of unrelated genera, also spread rapidly. Both are helpful in shaded areas beneath large spreading trees where grass is difficult to grow. As these species encroach on the well-established lawn, their control is easy with a power lawn-mower. New-York- and hay-scented-ferns form strong patches of yellow-green foliage from early spring until late summer. Hay-scented-fern is long lasting when cut, and its feathery leaves go nicely with floral arrangements.

Do not be tempted to include the common bracken, *Pteridium aquilinum*. It is hard to get started; once started, its vicious root-system makes it virtually impossible to eradicate.

Include a rock garden in your planting, either next to the house or on a built-up mound in a shady area. Border it with chunks of limestone; select chunks having weathered niches or create pockets between stones for miniature ferns. The native maidenhair- and ebony-spleenworts, *Asplenium trichomanes* and *A. platyneuron,* should do well here. Keep them moist; their planting in vertical clefts assures the excellent drainage they require. Purple cliffbrake, *Pellaea atropurpurea,* is also at home on limestone. Once established, it can tolerate limited dry periods. It is definitely not fernlike in appearance, but its soft gray-green leaves add a note of interest.

Bird-bath used as a focal point in backyard simulated woodland retreat, in which osmundas, lady-ferns, and shield-ferns predominate. Common polypody in left foreground.

Fern planting used to conceal high foundation line. Christmas-ferns, broad beech-ferns, silvery glade-ferns, and marginal shield-ferns, with neatly printed labels identifying the plants, in the author's "living reference-library."

Walking-fern, *Camptosorus rhizophyllus,* has a simple leaf, and its tendency to "walk" is unusual. Its long, narrow blades extend to new favorable locations where the budding apex quickly starts a new plant. The plant is difficult to grow in home gardens and most vulnerable to nocturnal attacks of snails and slugs. Using a commercial slug repellent is helpful but not always a full preventative.

The two bladder-ferns, fragile and bulblet, *Cystopteris fragilis* and *C. bulbifera,* can be used over and between the rocks. The brilliant green croziers of fragile fern appear long before true spring arrives. Croziers of the bulblet bladder-fern are reddish brown and appear a few weeks later. In addition to having spores for reproduction, this fern also has bulblets, little balls like small, crinkled garden peas on the underside of the leaf. At maturity, these drop to the ground and later make new plants.

Again — don't crowd your planting. Fern culture is simple. Allow the tree leaves to cover the plants in the fall. Do not remove the leaves in the spring by raking, since injury to the tender croziers is certain. Rather, lift the leaves by hand, shred them, and allow the shreds to return to cover the plants. The deeper the mulch, the more moisture will be retained for later hot, dry weather. Ferns really require no other fertilizing. For those insisting on an additive, limit the operation to a light sprinkling of bonemeal in the fall. Avoid ground limestone for the acid-loving ferns. Ground oyster shells are good where a loose, alkaline soil is needed.

Ferns reproduce by tiny spores generally borne on the underside of the leaf. The process is slow and mortality high, so that few spores get a foothold on life. Actually, it takes two to three years to get a plant started in this manner. For the serious-minded fern-lover, it is a thrilling experience to watch the germinating spore, the early growth of its intermediate stage or prothallium, and the first green leaf of the sporophyte or fern plant. Although time-consuming, it is truly rewarding and well worth the patience and effort.

May is building her house. Of petal and blade.
Of the roots of the oak is the flooring made,
With a carpet of mosses and lichen and clover,
Each small miracle over and over,
And tender, traveling green things strayed.

May is building her house. From the dust of things
She is making the songs and the flowers and the wings;
Yea, out of winter's flying sleet
She is making all the summer sweet.
And the brown leaves spurned of November's feet
She is changing back again to spring.

RICHARD LE GALLIENNE

"Island" garden rimmed with weathered limestone. Arrangement of rocks provides well-drained, vertical niches for common polypody, maidenhair spleenwort, and purple cliff-brake. Larger woodland ferns in center grow in deeply mulched soil.

1. *Viola langsdorfii*, darkest of the Alaskan violets, a rich purple-violet, and *V. epipsila repens* are most often found under the moderate cover of *Alnus* and *Salix* from lake level to the lower mountainsides, usually in moist soil.

2. *Gentiana algida* is found above two thousand feet. Its corolla, 3-5 cm. tall, is whitish with green striations. The entire plant may reach 10 cm. in height, which, on the barren mountain tops, is well above the surroundings; thus it is one of the more showy alpine dwellers.

3. *Saxifraga flagellaris*, the flagellate saxifrage, has bright yellow flowers, 12-18 mm. across. Red runners with minute bud and roots at the terminus are the distinctive character of this alpine species, which grows in rocky, unoccupied areas.

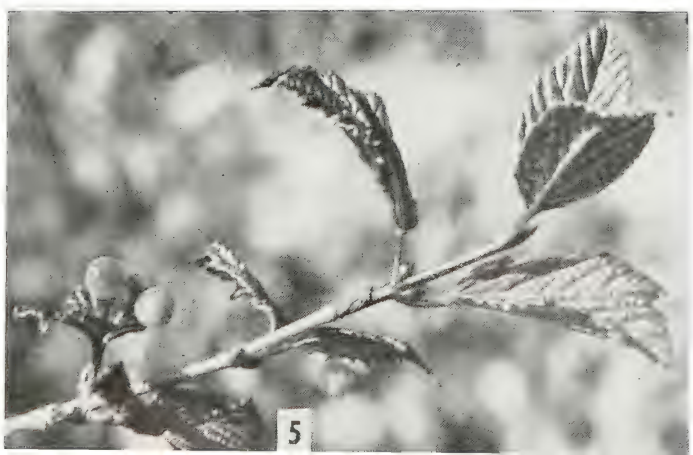
4. *Trientalis arctica*, the star flower, common in Washington, British Columbia, and on the Alaska Coast in the wooded regions, stands 8-12 cm. tall and bears a pink-white flower.

ALASKA'S NUSHAGAK DISTRICT FLORA AND FISH

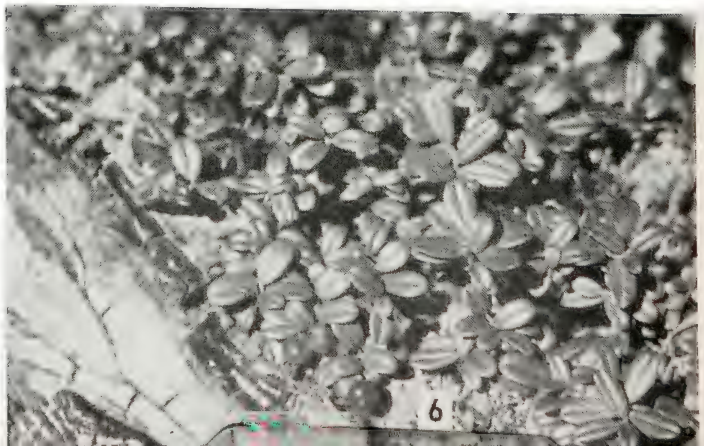
By KENNETH ROBERSON

Mr. Roberson is a fisheries biologist with the Fisheries Research Institute at the University of Washington, where he received a degree in fisheries biology. He has spent five summers in the Bristol Bay area of Alaska studying sockeye salmon. Mr. Roberson has also taken several courses in plant taxonomy and is a member of the American Rock Garden Society.

5. *Viburnum edule*, the high-bush cranberry, noted for its red fruit which is used extensively by Alaska natives, grows along the lake shores, surrounding tundra areas, and bordering streams. The fruit remains on the bush through winter and may be picked, still edible, in the spring. The leaves color brightly with the coming of fall and give the plant a little extra for autumn photography.



6. *Vaccinum vitis-idaea*, the lingen berry, mainly inhabits wooded areas; when found in open beaches, it is considerably more compact than the upright growth seen in the woods. The flower is a pink-white bell about 5 mm. long and the berry, which is edible, a bright red. *Linnaea borealis* and *Dryopteris linnaeana*, the twin-flower and oak-fern, respectively, are nearly constant companions of the lingen berry.



7. *Rubus chamaemorous*, cloudberry or baked-apple berry, is found on the tundra and other damp lowland areas. The flower is white and up to 25 mm. across, while the berry, composed of six to eighteen drupelets, displays a salmon color from which the name baked-apple originates. *R. pedatus*, *R. stellatus*, and *R. arcticus* are also utilized by the natives.

8. *Spiranthes romanzoffiana*, hooded ladies'-tresses, the only member of the *Orchidaceae* found to date in the Wood River area, inhabits the wet areas of tundra fields. The spike of white flowers is hardly noticeable from any distance. The plant may reach 30 cm. in height but surrounding vegetation is often taller thus camouflaging its three spiral rows of flowers.

9. *Lychnis apetala*, the nodding lychnis, sports purple-veined flowers on solitary stalks 6-8 cm. tall. The inflated flower, much like a Japanese lantern, nods with every little breeze. This species blooms in late June on the open alpine slopes.

10. *Ledum groenlandicum*, Labrador-tea, used very much as the name implies, can be found throughout the region on the tundra and in open areas. Crystal-tea, *L. palustre*, occurs on the higher hills and mountains and is also well distributed. Both species have off-white flowers trimmed with pink, which is especially noticeable as they open. The flowers are numerous on each stalk, and the plant often flowers prolifically.

11. *Lupinus nootkatensis*, a lowland species, is found in clearings, along roads, and the beaches. The Nootka lupine produces flowers from nearly white to the more blue and occasional tinges of red. The plant may reach a meter in height, with the raceme up to 25 cm. in length. There is some question as to whether the plant is toxic in Alaska.

12. A pale yellow corolla and silky leaves make the northern yellow oxytrope, *Oxytropis gracilis*, a very attractive specimen. This species, which may reach 40 cm. in height, is found from lake level to near fifteen hundred feet in open spaces. It is not known whether this species is toxic in Alaska.

TRAVEL WEST TO Bristol Bay and Dillingham where red salmon are king and all other endeavors play second fiddle. West to Bristol Bay and the Wood River Lakes, one of the several lakes and lake systems of the Nushagak District. These various bodies of water each form a part of a giant rearing ground for sockeye salmon fry and fingerlings. Sockeye salmon whose forebears have formed the backbone of the Bristol Bay regions economy. In sparsely populated areas, such as the perimeter of Bristol Bay, little effort is directed toward study of the natural sciences except for economic reasons. Studies of the geology, flora, and fauna in the past were most often stimulated by economic importance and only more recently have systematic studies been initiated by agencies of the United States Department of the Interior, either by their own personnel or by grants to research organizations and universities.

Studies of the rangeland or tundra, geology, and fish of the Nushagak District have been made as well as investigation of the spruce hens ecology. Nearly all studies are facilitated by government agencies or through government grants. Salmon, the most important resource economically, have been studied extensively since the early 1900's by the United States Fish and Wildlife Service, more recently by the Fisheries Research Institute of the University of Washington, which was formed in 1947, and the Alaska Department of Fish and Game formed when Alaska gained statehood. Although botanists have not studied the area, a geologist with the United States Geological Survey, J. B. Mertie, Jr., in 1930, 1931, and 1935 collected and had identified 142 species of plants from fifty-one families in an attempt to represent the most commonly occurring species of the Wood River and Tikchik Lakes region. My own collection includes photographs, pressed specimens, or field identification of over one hundred and fifty species, with an unfortunate neglect of the mosses, lichens, and grasses. Neither collection is by any means complete, although I have no knowledge of any other collection of the same magnitude from the area.

The work of the Fisheries Research Institute, in the Wood River Lakes, places six to eight personnel in the field from early June to late September each year to study the biology and environment of the red salmon and other indigenous species. Throughout the field season, little time is available for such endeavors as plant

13. *Primula borealis,* the northern primrose, which is well distributed through the Wood River system, occurs mainly on marshy or damp beach areas not pounded by wave action. It grows under partial cover of *Salix,* but most often on open areas close to water. Single flower-stalks and numerous stalks from a single plant occur as in other primulas. The flower is pink with as many as ten flowers to a stalk. Another specimen, *P. tschuktschorum,* occurs only rarely; its corrolla is violet with a lavender center.

14. *Moneses uniflora,* single delight or wax flower, is a white-flowered member of the Wintergreen Family. Normally a woods inhabitant, it is found on the lake beaches and stream banks in sand or gravel along with *Pyrola asarifolia* and *P. secunda,* the three species from *Pyrolaceae* occurring together with great regularity usually in shade.

15. *Cornus canadensis,* the bunchberry, is a common specimen throughout the wooded and semiwooded areas around the lakes. The floral bracts are white, the heads mostly dark, and the fruit orange-red drupes. The leaves and fruit are both colorful in the fall, making the plant an interesting photographic subject.

photography or collecting, since nearly all the daylight hours are utilized for performing the duties assigned. The types of sampling carried on and the brevity of the field season eliminate weekends as such, but not without compensation. Stream surveys and other sampling of eleven lakes on four river systems by boat and float aircraft give ample opportunity to collect and photograph over an extensive area.

Within the region elevations range from sea level to five thousand feet, and water bodies vary from tundra ponds to glacially formed lakes over twenty-five miles long and nine hundred feet deep. Moose, bear, wolverine, and beaver as well as eagles, swans, ptarmigan, and innumerable water fowl inhabit the area. Vegetation varies from tundra to spruce-birch forest and thick willow and alder patches, often covering entire hillsides, to barren mountain tops sporting a thin layer of small plants and lichens.

On the alpine mountainsides great mats of *Empetrum nigrum, Vaccinium uliginosum,* and *Arctous ruber (erythrocarpus)* are grown together, forming nearly solid cover. Several species of prostrate *Salix* are common, the catkins and new foliage excellent photographic subjects in June. Contrast these with the magenta of the abundant *Epilobium latifolium,* which may be found to fifteen hundred feet in certain areas, or *Rhododendron camschaticum* with its rich red blossom an inch or more across. Rhizome-type branching with only short stalks of leaves and flowers usually no more than six inches tall are unusual features of this rhododendron. Consider *Silene acaulis* in clumps eight inches across, its flowers of a pink-red hue so close together that little of the foliage can be seen, or the less noticeable *Pinguicula vulgaris,* a lavender-purple-flowered butterwort, which may stand only three inches tall in bloom. To cover any part of the mountainside flora, great detail of timing and environmental conditions which prevail for each species would be helpful. The objective in mentioning a few of the plants is only to serve as an indication of the mountain flora of our particular region. In common with other regions, the flora differs from mountain to mountain and from side to side on the same mountain. The lakes and streams are in the same category, with considerable difference occurring along a few miles of shore or stream course. Berry fields also are dispersed from mountain top to lake level, those close to the lakes being used by the natives.

Berries, picked by the women and children while the men and older boys hunt, are an important supplement to the diets of the natives and are interesting from several viewpoints. They are common along the lake shores, streams, and on the tundra. Several genera are represented and numerous species, *Ribes, Rubus, Vaccinium, Viburnum, Streptopus, Arctous,* and *Empetrum* are used, some more than others, as sources of nourishment by the natives. The berries are frozen, dried, or made into jelly. After the end of the fishing season the natives procure enough from the land in fish, moose, and berries to reduce their cash outlay considerably for the winter.

Salmon and fish resident in the lakes are netted after the families return from the commercial fishing season or as the fishing season progresses. Some members of the native families may stay home to collect personal-use fish. Gill nets are used in the personal-use fishery to catch pike, whitefish, arctic char, burbot, and salmon throughout the fall and winter until ice covers the lakes. Fishing resumes as soon as the ice leaves any portion of the lakes in the spring. Dogs consume a major portion of the fish collected, while the natives depend heavily

upon moose meat for subsistence. A family may easily use two moose in a winter and supplement it with rabbit, spruce hen, and ptarmigan. Not every family, however, has remained industrious enough to glean from nature's provisions.

There are Bristol Bay natives who have become overdependent upon commercial salmon fishing as a source of income, while others still trap each winter even though fishing was productive the previous summer. One resident of the village of Aleknagik fishes in the summer, hunts and prospects in the fall, and traps in winter and early spring. Many of the men help unload supplies from lighters when the steamship is in or work as laborers to supplement their income.

The pulse of the Bristol Bay region can be likened to the growing season. Dormant for eight months of the year, it bursts alive in late May, races to a peak of activity in early July, and tapers off as the fall wind and rains approach in August. Air travel has modified this pattern only slightly. A region oriented and dependent upon salmon which are available for two short months a year, that is Bristol Bay. The fishing industry, the flora and fauna not directly a part of it; a hit or miss situation; each striving to accomplish enough in a few months to survive another winter, and each fall a murmur in the background from the few thousand year-round residents of the Nushagak District, next year, next year, next year. The sturdy little *Rhododendron, Silene,* and other alpines must surely echo, next year, next year.

MONTICELLO (Continued from page 97)

A little over two months before his death on July 4, 1826, Jefferson considered the introduction of a school of botany at the University of Virginia. He expressed his opinion, in a letter to Dr. John P. Emmet, that it could be "taught advantageously only during the short season while nature is in general bloom, say during a certain portion of the month of May, when, suspending other branches of your department, that of botany may claim your exclusive attention."

Jefferson did not live long enough to pursue this project, nor did he see the ten gardens on the West and East Lawns of the University, which he proposed. He planned his "Academical Village" during 1821-1824. Over a century later the Garden Club of Virginia undertook the restoration of these gardens, completing the West Lawn in 1952, the East Lawn in 1965. The restoration was based on the Peter Maverick engraving of Jefferson's plans for his "Academical Village" that is preserved in the Alderman Library of the University of Virginia.

IRIS COMPANIONS (Continued from page 91)

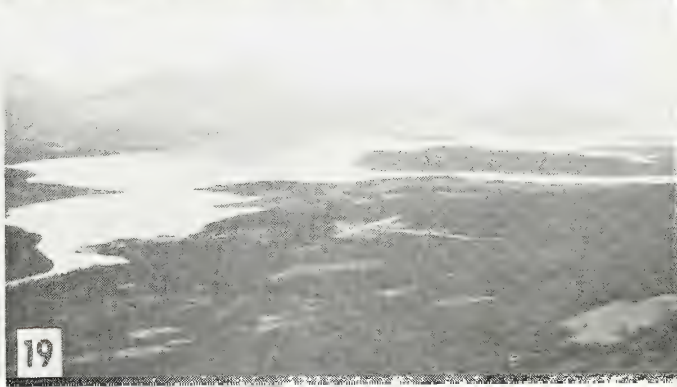
ers, such as the mock-oranges, deutzias, and spiraeas, and early-bloming species roses with small, single, yellow flowers. In the small garden, where even the shrubs must be seen close-up, a high proportion of such fine-leaved and small-sized shrubs should be used. They are

16. Lake Kulik and Mt. Wasky with typical terrain at the west or deep end of the lake. The elevations range from lake level, approximately two hundred feet, to five thousand feet atop Mt. Wasky. Poplars and willows cover the valley floor, while scrub-alder blankets the lower mountainsides.

17. The main camp of the Fisheries Research Institute on Lake Nerka, with Mt. Akuluktok in the background. The surrounding trees are of the forest type of the Wood River Lakes region, with birch and spruce most prevelant. Picture taken June 20, 1965.

18. Aleknagik School, with Lake Aleknagik in the background; the terrain is typical of the east or shallow end of the lakes. A road connects the village with Dillingham, port for the area The Wood River, outlet stream for Lake Aleknagik, also serves as a transportation medium to Dillingham for power scows and fish boats.

19. Lake Aleknagik from Marsh Mountain, where many of the alpine specimens were collected or photographed. The terrain is typical of the eastern or shallow end of the lakes. The portion of the lake shown is about sixteen miles long.



in scale with the size of the garden and provide a pleasant contrast to the swordlike iris leaves.

A shrub background is not the only attractive possibility. Tall bearded irises stand out satisfyingly in front of a dry stone wall which has been planted sparingly with such plants as *Veronica repens,* the maiden pink *(Dianthus deltoides),* moss phlox, and various sedums. And, particularly in the small garden, it may be desirable to display irises against a high screening fence. In this situation, shrubs espaliered against a fence or wall, or vines or climbing roses provide a pleasing background.

In the rock garden the pure pumilas, earliest of the miniature dwarf bearded irises, furnish a gay ground cover around daffodils and early tulips. Blue and purple hybrid varieties combine brilliantly with the glittering golden alyssum. Good choices are the maroon 'Blazon', with gold-embroidered falls, and the ruffled, light blue 'Azurea', more than a hundred years old and still charming. Beautiful, new, and more expensive hybrid varieties include 'Blue Frost', with light blue flowers of perfect form, and 'Angel Eyes', a lavish bloomer in white with the falls eyed in pure blue. Slightly taller, six to ten inches, and later hybrids such as the purple-toned 'Black Baby' and the light yellow-and-white 'Gay Lassie' look well in combination with the low, pink-flowered *Daphne cneorum.* My favorite in this group, the white and red 'Cherry Spot', perfectly accents a planting of yellow doronicum and lavender-blue polemonium. Clumps of the May-blooming, standard dwarf bearded hybrids are as effective in the large rock garden as in the perennial border, and charming as accents in even a tiny grace note of a rock garden.

THE SILVER SLIPPER ORCHID OF BERGEN SWAMP

By GEORGE A. ELBERT

Mr. and Mrs. Elbert, enthusiastic amateur botanists, write and lecture about the interesting places they visit to study and photograph native plants in their natural habitats.

CYPRIPEDIUM CANDIDUM is probably the rarest of our eastern lady's-slippers. Of the others the grotesque ram's-head lady's-slipper, *C. arietinum,* although small and less conspicuous, has a wider range and is found with relative frequency. The sighting of a small white or silver lady's-slipper, on the other hand, is an event to evoke intense curiosity and envy in all native orchid lovers.

There is one place where it can be visited and where, happily, it is protected. This is Bergen Swamp in western New York, the remarkable filled-in glacial lake which has been a mecca of botanists for over a century. When it was realized that cutting of arbor-vitae for fence posts by local farmers would destroy the orchids and other interesting species, a group of enthusiasts formed the Bergen Swamp Protection Society. The Society bought the land and polices it against vandalism. The Rochester Academy of Science has published a series of monographs on the plant life of the swamp—a model for this kind of study.

Since these facts were known to us, we were overjoyed when Dr. and Mrs. T. R. Liston of Hamburg offered to spend a day guiding us through the swamp. Lucile and Tom are research chemists who have traveled widely to find and photograph native orchids. It was also a lucky circumstance that the blooming date for the silver lady's-slipper coincided with the long Memorial-Day holiday; so on the Friday evening we drove to Batavia, which is half way between Rochester and Buffalo.

The next morning was gray and bitter, ideal weather for tramping and taking pictures, provided the rain held off. When the Listons arrived after breakfast, we started northward in our respective cars.

The countryside was almost flat and quite thoroughly farmed; without a known objective, one would be hard put to find any woodland. After driving a few miles we turned east, and in less than ten minutes Tom's hand pointed to the north. There an extensive shallow depression was filled with the solid black-green of a wet woods. On the other side, we could see the compensating rise of the meadows.

Bergen Swamp is about three miles long and one to one and a half miles wide. On the north side runs Black Creek, which alternately feeds and drains it. From higher ground to the south numerous springs feed limey water into it. Diatoms and algae, thriving in this element, have laid down the marl which occupies the center of the depression. Virginia and I were to see a true northern swamp for the first time, similar to those in Canada and northern Michigan. Thus many of our impressions would be quite new.

We trudged westward through an uneven wet meadow for a quarter of a mile, between a ploughed field and wet hardwood forest bordered with clumps of columbine alternating with starry false Solomon's seal *(Smilacina stellata).* The former offered the only bright spot of color we were to see all day.

Then we turned north again and descended into the forest where we followed a partly corduroyed trail. Here were sugar maples *(Acer saccharum),* elms *(Ulmus americana),* white ash *(Fraxinus americana),* and basswood *(Tilia americana).* On this damp day everything was sodden. Here and there the flower of *Trillium grandiflorum* showed in the darkness. The rest was a tangle of ferns and fallen woody debris thick with moss and lichens. Shallow depressions were an ooze of black muck.

Among the moss, lodged in the humid protection be-

tween two logs, or trooping along the edge of miniature mud ponds was the diminutive and inconspicuous *Mitella nuda,* a member of the Saxifrage Family. It seems hardly worth a glance, yet is one of the oddest of our wild flowers. The little plant is only a few inches high. Its flat leaves are heart- or kidney-shaped, the stem threadlike. The flowers are light yellowish green. At first we saw only the tiny star of the five-pointed calyx. However, with the aid of a magnifying glass we could see, notched between the sepals, the extending ribs or segments of the petals, each crossed by three naked side veins, like television aerials. These five, interlocking around the center, appear to be a fragile cobweb rather than any petals we have known.

Such a swamp as this consists of several levels of vegetation through which one passes on the way to the center. It was inevitable that this journey should suggest, on a tenebrous day, comparison however absurd with a descent of the rings of Dante's Inferno. We had come from meadow to hardwood forest and now for a little way, narrow at this point, we traversed the hemlock level in which most of the undergrowth disappears and only the black trunks, the dead and splintered lower branches, were visible. Then we climbed a little hammock where we stopped to rest in a grove of tall white pines *(Pinus strobus).*

Our next move was down the other side of the hammock, where we found a stream so shallow, though swift, as hardly to have cut a channel. Ahead we recognized arbor-vitae, marking the frontier of the true swamp, and thick clumps of sphagnum moss. Nestling under a small tamarack *(Larix laricina),* each cluster of blue needles cupping a little mirror of water, we were delighted to see the glow of our quarry, *Cypripedium candidum.*

The rare and beautiful *Cypripedium candidum.*

This lady's-slipper, only about a foot high, is a most original creation. Starting from the ground is a thickish stem clasped for much of its length by a short basal leaf and by two or three much longer leaves, which rise at an angle of forty-five degrees. The sheathing is so imbricated that they are rather crisply folded upward along the midrib, like an ironed napkin, so that one sees exactly half the normal underside of the leaf. The veinings, so sharp as to suggest the flutings of columns, accentuate the angularity.

The leaves thus form two long sides of a diamond of greenery, with the gleaming white sac positioned just above its center and an outsize bract rising high behind it. Appearing quite orbicular in perspective, the slipper is really rather elongate and its whiteness, on closer examination, is streaked with fine purple veins near the base.

The sepals and petals are greenish yellow with thin, dark purple stripings. The petals are long and twisted as in the yellow lady's-slipper. The column glows a deep yellow, splotched with irregular purple markings.

From every angle this stylish flower shows some nuance of form or structure. No wonder that ruthless amateurs have decimated it. It was well worth the trip to see *C. candidum,* and it is well worth every effort to preserve it from extinction.

After a half hour on our knees in the muck, we were glad to get up and look around. It was surprising (to us) to find the ground, a few feet away from the sphagnum, completely carpeted with trailing juniper *(Juniperus horizontalis).* Between this and the larger forms of tama-

Mitella nuda, a member of the Saxifrage Family and one of the oddest of our wild flowers.

rack and arbor-vitae was a narrow band of white blossoms, the umbels of the two-foot shrub, Labrador tea *(Ledum groenlandicum)*. Tom obligingly turned over a leaf to show the velvety brown tomentum.

Our way now led, for a hundred yards or so, through the arbor-vitae thicket, a level which elsewhere in the swamp is much wider, and into a clearing. This was the open marl of which we had heard so much. It is the inner level and the dreariest, an extensive plain of gray-white, powdery material soft enough, though dry, to take the impression of our boots. The islands of greenery were low and the forms rounded. Straggling over the ground were mats of juniper out of which grew, singly and in groups, hundreds of the orchids. Some even dotted the sterile marl which it found congenial. Had we not known that the phenomenon was virtually unique, we would have reckoned *C. candidum* a very common flower.

The shrubbery consisted chiefly of Labrador tea, *Potentilla fruticosa,* and bayberry. Between the gray overcast, the ground almost exactly the same color, and the stunted xerophytic forms, it was a dismal sight, the silence almost felt and not a moving thing, neither bird nor animal. What a strange habitat, we thought, for such a tender-seeming plant.

We went far out on the marl without finding any change in its monotonous beauty and then turned eastward. There the ground dropped slightly, and we found ourselves wading through a few inches of water, the marl still firm under our feet. From a low, desert landscape we had come to a low, submerged one. The usual small shrubs were there, rising out of immense masses of sphagnum, but the more watery types were also in evidence, especially speckled alder *(Alnus incana)*. The arrow grasses *(Triglochins)* and sedges bordered the thickets and formed clumps in open water. To complete our record of white flowers we came across swamp valerian *(Valeriana uliginosa),* with fleshy leaves and a thick stem topped by an umbel of waxy flowers.

"On the whole, a swamp is a wet prairie," writes Dr. Dansereau (*Biogeography,* 1957). The great southern cypress swamps with their constant water-level are just that. So are the familiar northern rush, reed, and cat-tail tangles which we found later along Black Creek and to the east.

The condition of the marl was unusual last year because of the effect of the protracted drought. Normally only the open marl, which bears the orchids, is above water-level much of the time. The rest, the secondary marl, is usually flooded.

It must be said that swamps are sadder and duller places than bogs. The vegetation of the former is dominated by grasses, while the latter, which are full of organic matter, bear many more flowering plants. Only the high lime content of the soil can account for the unusual number of interesting and rare species to be found in Bergen Swamp throughout the year.

As we were leaving, we met one of the members of the Bergen Swamp Protective Society who alternate as volunteer guardians of the preserve. It is good to know that there are people willing to perform this kind of service in contrast to those who regard rare flowers as a challenge to their horticultural skill and who dig them up only to have the flowers perish in their gardens.

The native foamflower, *Tiarella cordifolia,* in oaken shade at The New York Botanical Garden.

COURSES, LECTURES, AND OTHER GARDEN EVENTS

(For detailed information about a particular event or course, write or phone LU 4-8500)

CONTINUOUS SHOW IN CONSERVATORY—following the Easter Show and remaining until the Chrysanthemum Show in the Fall.

OUTDOOR DISPLAY IN MAY—Saucer magnolias, rock garden plants, flowering quinces, peonies, flowering peaches, azaleas, rhododendrons and mountain-laurel, native plants, irises, dogwood, viburnums, wisterias, lilacs, horse-chestnuts, hawthorns, Judas-tree, lady's-slipper.

"OUR TROPICAL NATIONAL PARK—St. John," illustrated Saturday Afternoon Lecture by Ruth H. Smiley on May 7, 1966, at 3:15 p.m. Auditorium of the Museum Building. Preceded by a half hour of recorded music.

FIELD BOTANY (8 weekly sessions)—Monday morning class, 10-11:45 a.m.; evening class, 7-8:45 p.m. Starts May 9, 1966. Museum Building. Instructor—Eleanor Yarrow.

"JOHN BURROUGH'S NOTES ON FLOWERS," illustrated Saturday Afternoon Lecture by Elizabeth Burroughs Kelley, on May 14, 1966, at 3:15 p.m. Auditorium of the Museum Building. Preceded by a half hour of recorded music.

"BIBLE LANDS," illustrated Saturday Afternoon Lecture by Gertrude H. Helbling, on May 21, 1966, at 3:15 p.m. Auditorium of the Museum Building. Preceded by a half hour of recorded music.

GRADUATION RECEPTION for students of the Two-Year Courses in Botany, Practical Gardening, and Landscape Gardening on June 7, 1966, at 8 p.m. Auditorium of the Museum Building.

OUTDOOR DISPLAY IN JUNE—Roses, summer lilacs, Japanese dogwood, honeysuckle, mock-orange, lilies, delphinium, hardy water-lilies, stewartias, tulip-trees, perennial flowers.

Admission to Saturday Afternoon Lectures, 25 cents, free to members of the Garden (upon presentation of membership card).

Nature Walks, fee $1.00 per person.

For fees of the various courses, see the Educational Program.

NEWS, NOTES and COMMENTS

A Joint Botanical Expedition will be conducted this spring by The New York Botanical Garden and the Science Museum of the Institute of Jamaica. The objective of the first exploration, undertaken in March, was a forest survey which took Dr. George Proctor, Chief Botanist of the Science Museum, and Gayle Jones, graduate assistant at the Garden, into the jungles near Bluefields on Nicaragua's Caribbean Coast. It is being financed by National Bulk Carriers of New York.

During April and May, the same two men have been making an inventory of the plants of the rain forests near Lake Izabel in Guatemala, which includes some of Central America's finest virgin forests. This is the first of a three-stage investigation in Guatemala which has been developed between The New York Botanical Garden and Dr. B. A. Krukoff, a botanist of long residence and extensive holdings in that country. Dr. Krukoff is interested in the development of botanical research there, especially where agriculture and lumbering are destroying the natural flora.

Desert Flowers. An exhibit of paintings on the "Wild Flowers of the Mojave Desert" has been on display in the Museum and Administration Building of The New York Botanical Garden since February. The paintings, done in acrylic and reproduced in serigraph, a process similar to the silk screen, are by Henry Mockel of Twentynine Palms, California.

This exhibit will be replaced on May 15, 1966, by one on "Rose Culture."

White House Library Additions. Among the two hundred and fifty books recently selected for the White House library by the American Book Association, as its latest quadrennial gift, were two by members of the staff of The New York Botanical Garden: *The Odyssey Book of American Wildflowers* by Harold W. Rickett and Sarrell Grehan and *Roadside Flowers of Texas* by Mary M. Wills and Howard S. Irwin, Jr.

Activities of the Director and Staff. Dr. William C. Steere, Director, in the past several months, has attended meetings of the Council of the American Association of Museums and of the Governing Board of the American Institute of Biological Sciences, both in Washington, D.C., and of the Executive Committee of Biological Abstracts and the annual meeting of the Board of Trustees of Biological Abstracts in Philadelphia. He participated in the Tenth Annual Conference of Directors of Systematic Collections in Hawaii, Members' Evening of The New York Botanical Garden at the Biltmore Hotel in New York City, and the Tenth Annual Conference of Biological Editors sponsored by the council of Biological Editors, Inc., at the University of Notre Dame in Indiana. He delivered a lecture on "Botanical Exploration and Research in the Arctic" in the Eleventh Annual Lecture Series of C. W. Post College on Long Island. In June Dr. Steere will attend the annual meeting for Museum Trustees and the annual meeting of the American Association of Museums, both to be held in Chicago.

Dr. Bassett Maguire, Head Curator and Coordinator of Tropical Research, and Dr. Tetsuo Koyama, Associate Curator, conferred with Dr. José C. M. Carvalho of the Museo Nacional, Rio de Janeiro, and President of the Association of Tropical Biology, Inc., on future programs of the Association during Dr. Carvalho's recent visit to this country.

Dr. Koyama has completed a research paper, entitled "The Systematic Significance of Leaf Structure in the *Cyperaceae-Mapanieae*," which will be published in *The Memoirs of The New York Botanical Garden,* and edited the Newsletter of the Association for Tropical Biology, Inc. (No. 1, March, 1966).

Dr. P. P. Pirone, Senior Plant Pathologist, addressed the first of six sessions of the annual Supervising Housing Groundsmen's Training Course for employees of the New York City Housing Authority on February 9, 1966. More than one hundred and fifty men heard his talk on "Care and Feeding of Trees and Shrubs under Drought Conditions." On February 16, he attended the final meeting of the Board of Directors of Sunken Forest Preserve, Inc., at its headquarters in New York City. More than seventy-five acres of land on Fire Island, New York, containing a fine stand of American holly, as well as primeval oak, sour gum, pine, cedar, and

Mrs. Charles Burlingham, the Garden's Honorary Curator of Museum Exhibits, mounts the paintings of wild flowers of the Mojave Desert by Henry Mockel. The plant pictured is *Lupinus sparsiflorus arizonicus.*

At the International Flower Show, The New York Botanical Garden arranged a choice selection of well-grown tropical plants, many from Central and South America, as a very beautiful, attractively designed tropical garden with a central pool and a background of palms. Several cycads gave height here and there in the foreground. *Salvinia undulata*, a floating cryptogamous annual, almost covered the surface of the pool, and sterile fronds of *Ceratopteris pteridoides* also floated on its surface. This exhibit, which was awarded The Horticultural Society of New York Trophy and a plaque for the best pool garden design, impressed professionals as well as amateurs with its variety of interesting and unusual plants. The orchid *Schomburgkia undulata* in flower attracted special attention.

sassafras, comprise the so-called "Sunken Forest." The Preserve will be turned over to the Department of the Interior so that it will be available forever to all lovers of nature. It will be maintained in its natural state and will be fenced in so as to reduce vandalism.

Dr. Pirone appeared in a TV commercial on the Alumni Fun Program over CBS TV Channel 2 on the last two Sundays in April and the first Sunday in May. He told of his experiences with malathion, a widely used insecticide. The program is sponsored by American Cyanamid Company; the moderator Peter Lind Hayes is the well-known radio, TV, and motion picture actor.

The March-April number of *Mycolgia* carries a brief article on a new species of fungus infecting maples which was discovered by Dr. Pirone. He described the fungus, *Phomopsis acerina*, in collaboration with Dr. J. C. Carter, Head of the Section of Applied Botany and Plant Pathology of the Illinois Natural History Survey.

Dr. Clark T. Rogerson, Curator of Cryptogamic Botany, recently gave a talk to the New York Mycological Society on "Polypores and their Relatives."

Dr. Herman F. Becker, Curator of Paleobotany, gave an illustrated lecture on "Here and There in the Rockies" as one of the Saturday Afternoon Programs at The New York Botanical Garden in the winter-spring 1966 series. Emphasis was on the geological interpretation of the landscape and on fossils. It has been necessary to add one hundred trays and four steel cases to house Tertiary plant fossils, collected during the past five years, in the Garden's Paleobotanical Department.

Mycologia Memoirs. The first issue of the new journal series, entitled *Mycologia Memoirs*, made its appearance in March, 1966. It is published for The New York Botanical Garden in collaboration with the Mycological Society of America by Hafner Publishing Company. Number One is devoted to "A Mycological English-Latin Glossary" by Edith K. Cash. *Mycologia Memoirs* is designated for articles on mycological subjects, substantially longer than those normally accepted by *Mycologia*, the official organ of the Society and published by the Garden.

The Native Plant Garden Committee of the Women's Council of The New York Botanical Garden maintains an office at 125 East Sixty-fifth Street, New York 10021, N. Y. Orders for the Wild Flower Notes should be sent there.

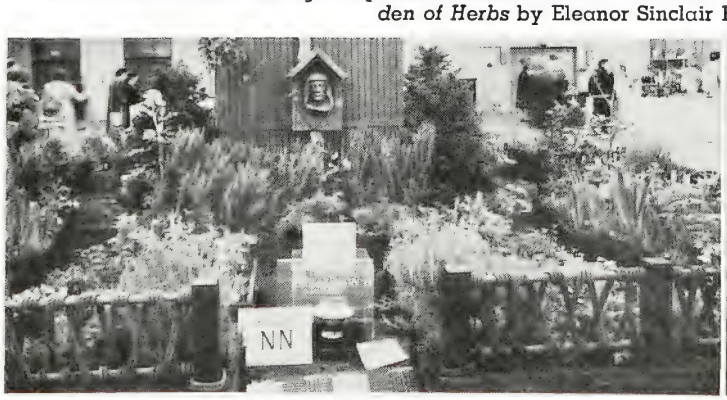
Staff Seminars were presented by Dr. Robert L. Shaffer, Associate Professor of Botany and Curator of Fungi, University of Michigan, on "The Agaric Genus *Russula*" on February 10, 1966, and by Dr. M. Tsukada, Research Associate, Department of Biology, Yale University, on "Man's Influence on Vegetation" on March 10, 1966.

Phil Clark, for three and a half years Assistant to the Director (Public Relations), left the Garden on April 15 to accept the position of Public Relations Counsel for the Field Museum in Chicago.

Besides heading public relations work at the Garden, Mr. Clark, for the past two years, also was in charge of membership and the Guatemala Tour.

Before coming to the Garden he served for ten years as garden editor and Sunday magazine editor of *The News*, Mexico's English language newspaper, and resided in Mexico. He continues to write *The News* garden page. He has also served as editor of *Horticulture*, Boston, as garden editor of *Living for Young Homemakers*, New York, as a feature writer for the *San Antonio Express*, and the *West Cen-*

A garden of liqueur plants, exhibited by the Tool Shed Herb Nursery of Salem, New York, at the International Flower Show, won the Bulkley Medal of the Garden Club of America and the L. Edward Dupuy Trophy. Many kinds of herbs; orange, lemon, banana, and coffee trees; fig, jasmine, and other plants used in making liqueurs; an old-fashioned copper still, an apple-press, an old water-pump from Helen Whitman's neighbors, and a wine cask from Cointreau—all were part of the fascinating exhibit, which was most artistic as well as educational. The head of St. Francis of Assisi in the front of the garden was done by Miss Whitman's mother, Georgia Squires Whitman, author of *Within My Garden Walls*. The wood cuts were enlargements from *Garden of Herbs* by Eleanor Sinclair Rohde (Herbert Jenkins, Ltd., 1926).



tral Minnesota Daily Tribune, and is the author of *A Guide to Mexican Flora.*

The Field Museum of Natural History exhibits world-famous collections in the fields of botany, zoology, anthropology, and geology and conducts explorations and research in these fields. It is particularly widely known among botanists for its work in Central American botany and its publication of a Guatemalan flora.

Dr. Fred J. Seaver, Curator Emeritus of The New York Botanical Garden, was interviewed by the *Globe-Gazette* during a recent visit to Mason City, Iowa, where he was called by the serious illness of his sister. Excerpts from the newspaper's report follows:

Born in Webster County on March 14, 1877, Fred J. Seaver was graduated from Manson High School in 1896; then taught country school near Manson. He was graduated from Morningside College in Sioux City in 1902, receiving a scholarship from the State University of Iowa to study biology. He received a fellowship the following year to continue his studies and was made an assistant in the biology department. He then became an instructor and then a professor at Iowa Wesleyan College.

Mr. Seaver was granted a leave of absence to study at Columbia University, at the same time working at The New York Botanical Garden. He was invited to go to Fargo, North Dakota, as assistant professor in the biology department of the state university. However, before the year at Fargo was over, he returned to Columbia and The New York Botanical Garden. Dr. Seaver spent forty years at the latter institution, retiring in 1948.

Dr. Seaver, who has lived in Florida since then, served two years as a visiting professor at Florida Southern Methodist College in Lakeland and two and a half years as visiting professor of Orlando Junior College. He is the author of two college textbooks, has written many papers in mycology, and, for twenty-two years he was editor of *Mycologia.*

Jeanette Kittredge Watson, widow of Thomas J. Watson, Sr., former head of the International Business Machines Corporation, died on February 10, 1966, at the age of eighty-two. Mrs. Watson had worked closely with her husband and had traveled many miles with him, here and abroad, in the interests of I.B.M., and served as a director of I.B.M. World Trade Corporation and later of I.B.M. Corporation.

Mrs. Watson was active in civic, educational, philanthropic, and religious organizations and among the many recipients of her generosity were Lincoln Center for the Performing Arts, Colgate University, St. Paul's Chapel of Columbia University, and The New York Botanical Garden. She was a member of the Corporation of the latter organization, and of its Advisory Council, recently renamed the Women's Council of The New York Botanical Garden.

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B. Y. Morrison died on January 25, 1966. He was long identified with the United States Department of Agriculture and the first director of the National Arboretum. Mr. Morrison, upon retirement, moved to Pass Christian, Mississippi, where he continued work with the Glenn Dale hybrid azaleas and took a keen interest in his Oriental magnolia collection. For many years he was active in the affairs of the American Horticultural Society and edited its publication, *The American Horticultural Magazine,* the April issue of which is devoted to daffodils and dedicated to him.

Visitors to the Garden in Recent Months

Dr. Blanca R. Arrillaga de Maffei, Facultad de Agronomia, University of Montevideo, Uruguay.

Dr. José C. M. Carvalho, Museu Nacional, Quinta Boa Vista, Rio de Janeiro, Brazil.

John C. Stevenson and Dr. Carl Withner, Biology Department, Brooklyn College, Brooklyn, N.Y.

Carl D. Clayberg, Connecticut Agricultural Experiment Station, New Haven.

H. H. Howard, Skidmore College, Saratoga Springs, N. Y.

Dr. F. R. Fosberg, and Dieter C. Wasshausen, Smithsonian Institution, Washington, D. C.

Dr. Donald P. Rogers, University of Illinois, Urbana.

Dr. M. C. Choudhary and Dr. R. S. Wood, University of Rhode Island, Kingston.

Dr. Z. Iwatsuki, Hattori Botanical Laboratory, Japan.

Dr. Robert L. Shaffer, University of Michigan, Ann Arbor.

Dr. and Mrs. Orson Miller, Forest Disease Laboratory, Laurel, Md.

G. Savelle, Applied Physics Corporation, Los Angeles, Calif.

Dr. J. Goldberg, University of Hawaii, Hawaii.

Dr. David B. Baker, Rutgers - The State University, New Brunswick, N. J.

Seventeenth International Horticultural Congress. Exciting discussions, tours, and social events to please the varied interests of members of horticultural, botanical, and plant specialty groups will be offered during the Seventeenth International Horticultural Congress, August 15-20, 1966, at the University of Maryland.

Under the theme of "The Plant, The Environment and Man," Congress sessions —the first ever conducted in the United States—will bring together plant scientists and enthusiasts from around the world. Twenty-two stimulating topics include growth and flowering control through chemicals, new trends in vegetable breeding, control of tree size, and stabilization of Latin names for cultivated plants.

There will be diversity, too, in tours—Colonial Williamsburg, Longwood Gardens, National Arboretum, Beltsville Ex-

periment Station, Seabrook fruit and vegetable farms, and homes, gardens, and national monuments in Washington, D.C., Georgetown-Alexandria, and Annapolis.

Social highlights are a Hawaiian luau at the National Arboretum, a reception at the United States Department of State, and numerous banquets and teas.

The Congress is sponsored by the International Society for Horticultural Science, the American Horticultural Society, and the American Society for Horticultural Science, with the cooperation of the American Institute of Biological Sciences.

Window Box Program of Park Association. Five dreary blocks in the Bedford-Stuyvesant Avenue of Brooklyn, New York, were brightened last year by five hundred window boxes of red geraniums and ivy. Two hundred and fifty families were directly involved. The Park Association of New York City, aware what has been accomplished during the last thirteen years in developing over four hundred garden blocks in slum neighborhoods in Philadelphia, initiated the window box program and hopes that it will eventually spread throughout all the low-income neighborhoods in New York City.

Before a block could participate, eighty per cent of the buildings had to join in the program. Block residents paid a nominal sum for each fiberglass window box filled with soil, geraniums, and ivy; the boxes were of three sizes, eighteen, twenty-four, and thirty inches. The difference between the amount paid by the block residents and the actual cost was provided by the Park Association through private grants from two foundations. The City's Park Department cooperated by planting twenty-seven trees on the participating blocks.

This spring the Park Association plans to extend the program to cover twenty-five blocks in five communities, the Bedford-Stuyvesant in Brooklyn; Corona-East Elmhurst in Queens; Claremont District in the Bronx; East River-Metro North in East Harlem; and St. Nicholas Park area in the Bronx. The number of boxes installed this spring will depend upon the success of the fund-raising campaign. The cost of each five-block project is $2,500.

Under long-range plans, the Park Association looks forward to adding twenty-five blocks each spring. By the end of 1968, eight thousand boxes will have been installed and eighty otherwise drab blocks will have become garden blocks, provided, of course, that foundations and individuals will share the Park Association's enthusiasm and give support to this worthy program. Mrs. Donald R. Johnston, Vice President, is Chairman of the Park Association's Neighborhood Improvement Committee. The Association's address is 15 Gramercy Park, New York, N. Y. 10003.

United States Soil Conservationa Service Sets Up Research Farm Near Cape May, New Jersey. In March 1962, a combination of high winds, high tides, and driving rains washed tons of sand, soil, and buildings into the ocean and wrought billions of dollars worth of damage along the eastern seaboard. Many structures, however, stood staunch against the storm, and it was found that they were on plant-bearing dunes. Grasses and trees held the soil intact despite the violent elements.

Consequently, Congress acted to preserve the dunes from Cape Cod to the Virginia and North Carolina Capes and to increase the use of grasses, shrubs, and trees to strengthen the dunes structure. It empowered the Soil Conservation Service to set up the Cape May Plant Materials Center, provided the State of New Jersey would supply the land. The State purchased the Barber Farm in Swainton, New Jersey, near Cape May Courthouse. The land used for buildings was deeded to the Soil Conservation Service, and the remainder was made available on a long-term lease.

Dr. Virgil Hawk, for many years with the Soil Conservation Service, is in charge of the Center, and he is assisted by W. Curtis Sharp. They have the task of soil improvement along the eastern coast from Cape Cod to Kitty Hawk.

In addition to combating erosion by developing better, more resistant plants, shrubs, and trees, the new center will evaluate economies in irrigation. Approximately sixty acres are being irrigated, and cost data are being assiduously kept. Transite Irrigation Pipe is used for the main line. This asbestos-cement pipe cannot rust and will not tuberculate because it is nonmetallic. It withstands a wide range of soils. The solid set lateral pipe is Johns-Manville 125 PVC Plastic with Ring-Tite joints. Since this pipe is free to expand and contract within the joints, no "snaking" has been necessary. The sprinkler heads act in sequence to reduce the load on the pump and make possible the use of minimum pipe sizes.

Crab-Grass Control. The strange way in which a unique chemical controls crabgrass in lawns is being cleared up, Dr. Mark B. Weed, Senior Research Biologist of E. I. du Pont de Nemours and Company, disclosed at a meeting of the Weed Society of America.

Dr. Weed reported that the compound, siduron, prevents root growth of crabgrass while not affecting roots of common cool-season lawn grasses. The chemical is the active ingredient in du Pont's "Tupersan" weed killer, introduced in 1965. The chemical should prove valuable to home owners, because it appears to be the only effective weed killer which can be used at time of seeding with a good margin of selectivity to many germinating cool-season turf grasses.

Dr. Weed reported that repeated yearly applications of siduron had little or no effect on root systems of many established cool-season grasses, even when the chemical is applied at extremely high rates.

Studies indicate that the major means by which siduron disappears from the soil is through microbial degradation.

Dr. Weed also reported that research results indicate siduron is tolerated by many trees and shrubs, is unaffected by ultraviolet light from the sun, and is very resistant to leaching.

Geranium 'Galaxie'.

Two New Geraniums. 'Orange Glow', a luminous scarlet-orange, and 'Galaxie', scarlet-rose, are being introduced this year. They were developed by Dr. Griffith J. Buck of Iowa State University. The plants are compact and short-jointed, and the large flower-heads are carried on stout stems capable of resisting wind and rain damage when planted in beds or borders. They are also desirable for growing in window boxes and planters.

New Ornamentals from U.S.D.A. Two viburnums, an hibiscus, and a pyracantha, developed at the United States National Arboretum by Dr. Donald R. Egolf, have been released to qualified nurserymen for propagation and distribution to American gardeners within two or three years.

Viburnums 'Mohawk' and 'Cayuga' are well adapted to areas as far north as Ithaca, New York. Both are early flowering and resistant to bacterial leaf spot and powdery mildew. 'Mohawk' produces clusters of brilliant red buds opening to white flowers which have a pleasant, spicy odor of cloves. The glossy, dark green leaves turn brilliant orange-red in the fall. 'Cayuga' has many pink bud clusters which open to white flowers. Although the flower clusters are small, their great number gives a mass flowering effect. The leaves

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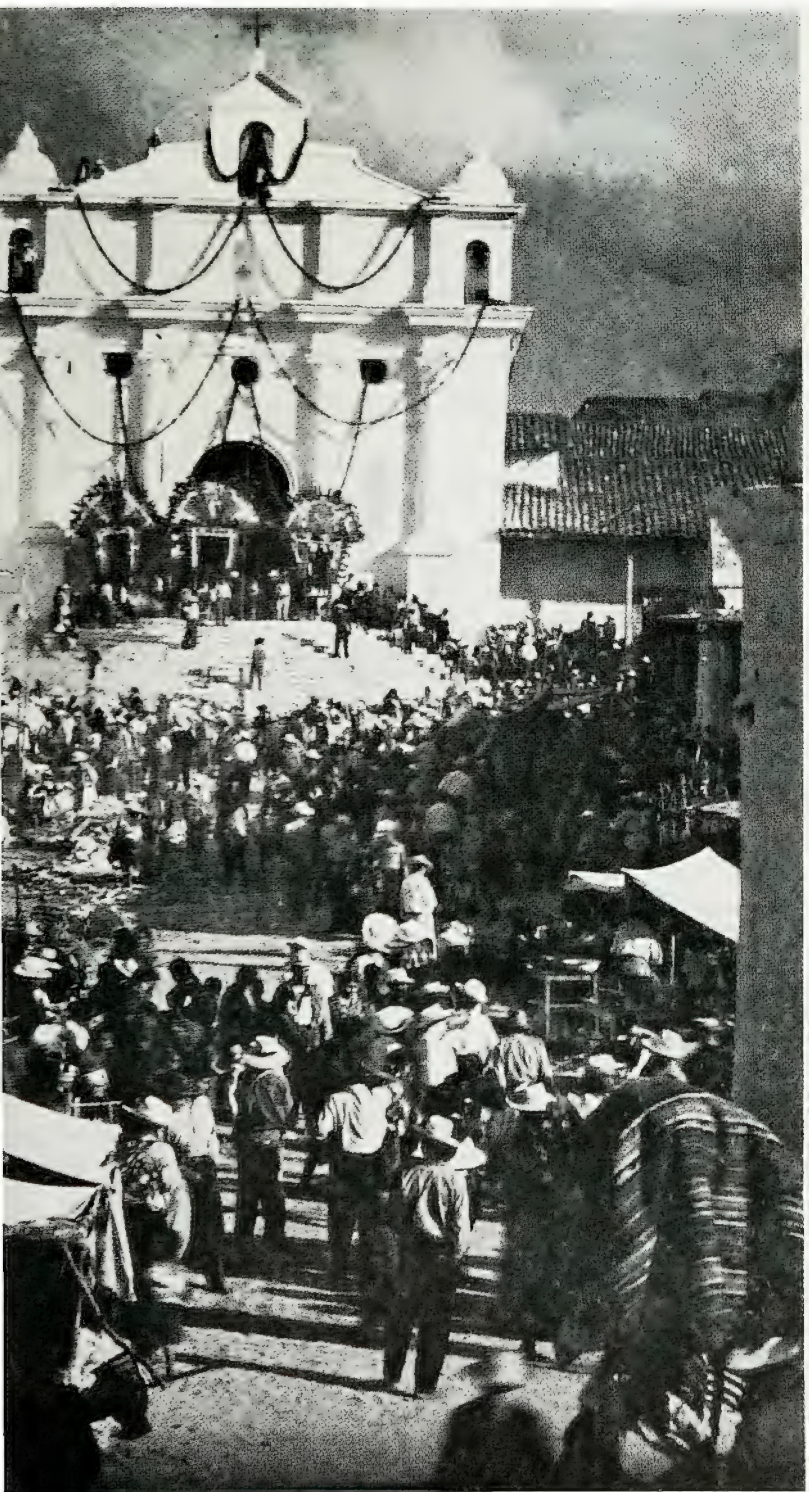

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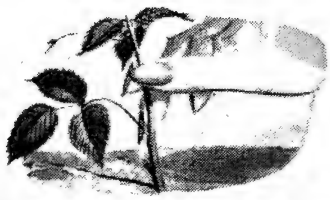

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are smaller, of better color than other viburnum varieties, and turn dull orange-red in the fall.

'Shawnee', the new pyracantha, produces glossy, clear yellow to light orange fruit as early as August and maintains this color until midwinter. The plant is resistant to both scab and fire blight. The foliage is semipersistent.

'Vulcan', a new variety of *Hibiscus rosa-sinensis,* is a semitropical shrub with heavy, leathery flowers. The brilliant red petals have ruffled edges with gold undersides. 'Vulcan' is more resistant to insects than many other hibiscus varieties.

A new privet, 'Cheyenne', which will be available this spring, has proved more cold-hardy and drought-resistant than the common privet. Tested at Sioux Falls, South Dakota, Boise, Idaho, and Sheridan, Wyoming, also in southern Wisconsin, southern Michigan, and Iowa, it showed ample hardiness in these areas. The foliage, which is a grayish olive-green, lasts into autumn without change of color; the jet black fruit remains on the plant well into winter. 'Cheyenne' grows vigorously and thrives when sheared; it makes a dense clipped hedge. This new privet was developed at the Agricultural Research Service from a Yugoslavian introduction and is released cooperatively by this Service and the State Agricultural Experiment Stations of the Northcentral Region.

Katsura-Tree for Light Shade. "If you're looking for a fast-growing tree with good foliage which gives filtered shade, consider the Katsura," suggests Walter Haldeman of The Pennsylvania State University. As the heart-shaped leaves unfold in early spring, they have a purplish color; in summer they are bright green, and in autumn they turn pinkish yellow. A mature Katsura-tree *(Cercidiphyllum japonicum)* stands fifty to sixty feet tall.

It grows best fully exposed to sun, in a rich, moist soil and is hardy as far north as southern Canada. Grass grows well beneath it, because its roots go deep.

Many trees, in addition to the Katsura, are described in the Penn State correspondence course on the selection and care of trees for home landscaping. A course copy will be furnished by sending name and address with $1.50 to Trees, Box 5,000, University Park, Pennsylvania 16802.

Tropical Botanical Garden Appoints Executive Director. The Trustees of the Pacific Tropical Botanical Garden have announced the appointment of Mateo Lettunich as Executive Director of the corporation. Until the end of 1965, Mr. Lettunich was Deputy Director of the Special Projects Department and head of the Arts Program of the Institute of International Education in New York.

The Pacific Tropical Botanical Garden will include facilities for research in the use of tropical flora in agriculture, conservation, forestry, horticulture, and medicine. The project, privately financed, will operate in cooperation with educational and research institutions in this country and abroad.

Eminent botanists, headed by Dr. Henry Skinner, Director of the National Arboretum in Washington, D. C., and including Dr. Harold R. Fletcher, Director of the Royal Botanic Garden, Edinburgh, and Dr. Knowles A. Ryerson, of the University of California and a member of the South Pacific Commission, visited Hawaii last autumn to view sites and make recommendations on the location of the garden.

The trustees named originally in the Congressional Charter of the Pacific Tropical Botanical Garden are Horace M. Albright, Los Angeles, California, retired head of the National Parks Service and now president of the Botanical Garden corporation; Henry Francis duPont, Winterthur, Delaware; Deane W. Malott, Ithaca, New York, President Emeritus of Cornell University; Paul B. Sears, New Haven, Connecticut; and the late Robert Allerton of Hawaii, whose place has been filled by his son, John Gregg Allerton. Trustees who have since joined the board are Robert B. Anderson, former Secretary of the Treasury, and Mrs. Vincent Astor, both of New York City; Mrs. A. Lester Marks and W. W. G. Moir, of Honolulu, Hawaii; S. Dillon Ripley, Secretary of the Smithsonian Institution, Washington, D. C.; and Mrs. Philip K. Wrigley of Chicago.

Counsel for the Tropical Botanical Garden is Oscar Chapman, former Secretary of the Interior. Offices of the corporation will be maintained in Washington, D. C., and New York City.

The Center for the Biology of Natural Systems has been established at Washington University in St. Louis, Missouri, through a grant of $4,250,000 from the United States Public Health Service. Dr. Barry Commoner, Chairman of the University's Department of Botany, has been appointed the Director of the Center which will "study how man is contaminating the environment and will concentrate on the interaction of people, plants, and animals, and the complex feedbacks of these relationships."

The Missouri Botanical Garden and the St. Louis Zoo will cooperate with the new Center.

The First Exhibition in New York of the Shizan-Ryu art of bankei and fucho-ga was held at the Nippon Club.

Bankei, which is familiarly known as tray landscape art, is the portrayal of scenery in three dimensions. Fucho-ga, which is also a three dimensional art, is more elegant and ambitious in composition and can be used to create modern as well as classical effects. Sanko Kajihara, an outstanding exponent of both art forms, exhibited her own work as well as the work of students studying under her.

Mrs. Kajihara, a graduate of the Ogikubo Art School and the Shizan School of Fine Arts, Tokyo, Japan, was featured in *The Garden Journal* of The New York Botanical Garden and most recently at the Courtier Gallery and the Stamford Museum. In 1965, she conducted classes in bankei at the Brooklyn Botanic Garden.

Tree Peony Festival will be held May 26-June 2, 1966, at the William Gratwick Gardens, York-Pavilion Road, Pavilion, New York.

FERN VALLEY

In the National Arboretum in Washington, D.C., a botanical research and educational center operated by the Agricultural Research Service of the United States Department of Agriculture, there is a beautiful natural valley through which flows a small stream. Less than ten years ago the valley was a "farm gulley—a trash-filled ditch." This is a noteworthy example of conservation education in which local organizations are playing an important role.

A pilot planting of ferns was made in the mid-1950's by the American Fern Society. Then in October, 1958, Mrs. Charles Bittinger, now Honorary President of the National Capital Garden Club League, Inc., who has been interested in ferns and wild flowers since childhood, presented a basic collection of one thousand ferns to the Arboretum.

The plants were "heeled in" until the Arboretum completed clearing and cleaning up the four-acre tract, dammed and widened the spring-fed stream, built foot-bridges, and laid a trail. The ferns were planted, and in the intervening years thousands of plants—ferns and wild flowers and native shrubs—have been added by the National Capital Garden Club League which adopted Fern Valley as a project. Working closely with the Arboretum's staff, the planning and planting have been carried out by the League —mainly by women and some of the men who are members of the garden clubs which belong to the League. As an example of how devoted League members are to this project, they salvaged some seven hundred clumps of maidenhair fern *(Adiantum pedatum)* from a hillside in Maryland, doomed by road construction, and planted them on a slope in Fern Valley.

Mrs. Robert W. Cheves, in an article in the League's Bulletin, April, 1964, wrote: "Fern Valley plantings are grouped ecologically—the master plan calls for areas typical of the major forest types in the eastern United States. Special habitat areas are woven in the overall pattern—an acid bog, an open marsh, a dry roadside bank—showing the wide range of moisture conditions to which certain plants are adapted. The ph tolerance of some plants is illustrated with the acid-soil-sandstone area of Polypody Pond, the talus of epidote rock which is neutral in reaction, and the alkaline limestone 'cliffs'."

A spring-fed stream flows over the limestone cliff of Fern Valley, where ferns which flourish i rocky areas are planted. Fern Valley is one of the attractive features of the United States Nationc Arboretum in Washington, D.C.

Many individuals and organizations have participated in the development of this project. For example, the National Capital Orchid Society became interested in Fern Valley through its former secretary, Vera Erling, now associated with the National Park Service in New Mexico. Under the leadership of Dr. Frank Schairer, an authority on native orchids, the Society raised money for the purchase of one hundred *Cypripedium pubescens*. Since then members of the Society have contributed and planted *Cypripedium acaule, Goodyera pubescens, Habenaria ciliare,* and *Orchis spectabilis.*

Orchids and other wild flowers, as well as ferns, are naturalized in this enchanting section of the Arboretum. Along this trail is an identification chart of the birds which flourish in this peaceful retreat.

BOOK REVIEWS

ISLAND LIFE—A NATURAL HISTORY OF THE ISLANDS OF THE WORLD. Carlquist, Sherwin. 451 pages + I-VIII, illustrated (part color), indexed, bibliography. The Natural History Press, Garden City, New York. 1965. $9.95.

The mystery and fascination islands hold for man are easily traced far back into his history. Early accounts of voyages and exploration were immensely popular, especially when well illustrated to show the strange plant and animal life and the people inhabiting distant lands. But the real significance of these isolated areas was not to be grasped until Charles Darwin provided the keys which were to unlock doors to whole new worlds of thought for the naturalists of his time. One of these men, Alfred Russel Wallace, published a book entitled *Island Life* in 1880, setting the stage for modern biogeography. In this volume and in similar works were the theories, the concepts which could begin to explain on a scientific basis the peculiar facts of plant and animal distribution. Here were the foundations for an understanding of the marked similarities between geographically distant or unrelated regions, or of the striking dissimilarities in the floras and faunas of geographically related, neighboring areas. Wallace's concepts were based on detailed studies of plant and animal forms and their specific inter-relationships to each other and to geographical regions, and when possible to the geological history of the earth. Numerous scientific papers and books have been written since, and all, to some degree, show the influence his views have had upon the study of natural history, but few books of this type have been written which could recapture the interest of the old expedition reports and their lavish illustrations; the facts were too "scientific," the data too dry, the discussion too cold, and the illustrations were technical abstractions.

Dr. Sherwin Carlquist, Associate Professor of Botany at Claremont Graduate School in Claremont, California, has provided the amateur naturalist as well as the specialist with an enjoyable new, fresh outlook in his book *Island Life—A Natural History of the Islands of the World.* The attractive cover is only a hint of the contents which, within a well-bound book, include an amply illustrated, easily read text. Seven excellent color plates (of which four are orginal illustrations by Charles S. Papp) and numerous ink drawings of animals by Mr. Papp and plants by Jeanne R. Janish, together with biogeographical maps and original photographs by the author supplement the text.

There is nothing dry or pedantic about Dr. Carlquist's style of writing; instead, along with the factual material there is a certain lightness to the author's approach, an undercurrent of pleasurable humor which appears with regularity, indicating his love for this work. Some of the chapter titles are especially suggestive of this point: (1) "The Island Condition"; (2) "Getting There is Half the Problem"; (6) "The Magnificent Substitutes"; (8) "Some Remodeled Plants"; (9) "They Can't Go Home Again"; (11) "The Ostentatious Males"; (13) "Museum-Piece Plants"; (14) "The Inefficient, the Unafraid, and the Obsolescent"; (15) "Darwin's Islands"; as well as (16) "Lemure Land." This book is by no means a repetition of Wallace's work or style; in approach and example it stresses originality. Aside from new discussions of certain classical studies, most of the examples are fresh and original, based often on very recent research, and that, in turn, frequently the author's own work in anatomy, an important tool used to determine relationships in plants and animals.

I lived in the Hawaiian Islands for two years and had the opporunity to visit briefly the Galapagos and some of the other islands discussed in this book, and so Dr. Carlquist's examples treating these areas were of especial interest. The Sunflower Family *(Compositae)* are most curiously represented on Pacific Islands, and the author's comments are truly interesting. Joseph Rock's work on the Hawaiian Lobeliads has never received adequate treatment by such a text, and Dr. Carlquist's discussion is very informative . . . but then he has done extensive research of his own for both groups and so should be able to speak authoritatively. Plants and animals are discussed in good balance, neither group receiving disproportionate attention. Crampton's series of monographic papers on the variation, distribution, and evolution of the land-snail genus *Partula* appeared over a period of sixteen years. The geographical and ecological information is nearly inaccessible, but Dr. Carlquist has extracted and interpreted the essence of the biological data for his text, giving it a new life.

For those interested in birds, Dr. Carlquist's book treats the unique birds-of-paradise and the bowerbirds of Australia and New Guinea, as well as Darwin's Galapagos finches, the Hawaiian honeycreepers, and some of the flightless forms and giants which seem to have best developed in the southern hemisphere; these are especially well illustrated in the color plates and ink drawings.

Of the mammals and reptiles the illustrations are typically original and often startling, the discussion thoroughly enjoyable.

The bibliography, appearing at the conclusion of the text, is arranged alphabetically by chapters, and as an aid to the reader unfamiliar with the references, the author has indicated the nature of each by placing a letter "G" (for general interest, not only to the specialist but to the lay reader with an unspecialized background), a letter "T" (for technical, containing a formal description, usually not in general circulation but available through libraries or museums . . .), or a letter "I" (indicating illustrated, containing good photographs or drawings of animals or plants, especially habit pictures . . .); sometimes a combination of letters is used. At first I found this approach disconcerting, but there seems to be a real advantage in having the text unbroken in its "line of thought" by the inclusion of references, and the few repetitions which appear in the bibliography where the same publication is used in more than one chapter is of no serious inconvenience. Certainly there is an advantage in Dr. Carlquist's one letter key to the nature of each publication, especially for the amateur naturalist or lay reader.

The book recommends itself. It should occupy a place of value in the high school biology library as well as in the university library, not to mention the private library of the nature lover or specialist in biogeography.

HENRY WHITTIER

THE CONCISE BRITISH FLORA IN COLOUR. Keble Martin, W. 131 pages + 100 plates (the last six in black and white), glossary, indexed. Holt Rinehart & Winston, Inc., New York. 1965. $9.95.

The wild flowers of the British Isles have been under close scrutiny at least since the time of John Ray (d. 1705), and the literature of the subject is now of enormous scope and volume. Contemporary botanists in the United Kingdom are served by an admirable descriptive Flora (Clapham, Tutin & Warburg) currently in its second edition and backed up by a matching volume of illustrations. Also available, though less complete, are Hutchinson's *British Wild Flowers* (2 vols., 1955) and Hubbard's *Grasses* (1954), companion paperbacks replete with technically brilliant drawings, and Ross-Craig's universally admired series of plant portraits; while old favorites, such as Rev. C. A. Johns' *Flowers of the Field,* are still being reissued. Furthermore *Flora Europaea,* in course of publication, will soon cover the same ground as part of a larger project. On the face of it another British Flora, illustrated or not, must appear superflous. But this lovely book, which reflects credit on all concerned with its publication, is something apart from the general run of floristic works, a book which without sacrifice of scientific accuracy and without dilution of the matter, makes its primary appeal to the aesthetic sense.

The substance of the Concise Flora is the century of plates, the fruit of a busy clergyman's hours of leisure stretched out over a span of sixty years. Opposite each plate there are for each species three or four lines of supplementary description and brief habitat data, but the plates are the thing. It is a marvel of ingenuity to compress nearly fifteen hundred separate figures at life size (together with a sprinkling of enlarged sectional views of individual flowers) into one hundred pages measuring seven by ten inches. This feat has been accomplished by allowing the figures to overlap where necessary or convenient, the rank lowest on a page standing, as it were, in front of the next higher and so on upward. In less skillful hands the effect would be confusion, but Mr. Keble Martin, with an art that I should call diabolical in another context, has so arranged matters that flowers of pale coloring, which

might otherwise be lost against a white background, are set against a neighbor's foliage. Thus each plate becomes not merely an assembly of separate figures brought together for systematic reasons but, in addition to that, an integrated garland. In a modest foreword the author explains how the plates were worked up over periods of many years, each sort being drawn only as a living specimen became available, and fitted into a prearranged pattern following the ninth edition of the London Catalogue. The freshness and vitality which breathe from every page of the Concise Flora come directly, of course, from the living model and are in marked contrast with the stiff and awkward quality of much botanical drawing done (as it often must be) from herbarium specimens. I notice in particular the attitude of frail parts, such as stamens and pistils, is here invariably true to nature, and it is details of this type which make the difference between a portrait and a diagram.

Detailed coverage of the whole phanerogamic flora of the British Isles cannot be expected in a book of this sort. The troublesome thickets of brambles, the swarms of hawkweeds, and the microspecies of *Sorbus* are sensibly dealt with by illustrating a typical member of an aggregate group and indicating the existence and often the characters of closely allied forms in the text opposite. Some very rare British natives, such as the orchid *Epipogium,* were obviously not available to the artist in living form, and are therefore described but not illustrated. But *Diapensia,* discovered so recently in Scotland, is present, as are the rare Welsh sea-lavender, *Limonium transwallianum,* and a fine array of difficult fumitories. The Flora truly is a concise one, but nowhere superficial. A pupil at Oxford of Sydney Vines (who was in turn a pupil of Huxley), Mr. Keble Martin is an amateur botanist only in the best and original sense of the term. Long a Fellow of the Linnaean Society, he has enjoyed the friendship and advice of several generations of Britain's most astute botanists, among them Pugsley, Sandwith, Wilmott, all of whom contributed advice or specimens to the grand design. The inflexibility of the taxonomic order, laid down half a century ago, will make the book appear somewhat old-fashioned to those growing up with the modern floras; but this is a small matter, and in other respects the Concise Flora incorporates the best and latest in taxonomic research. Here, already, is *Dactylorhiza* for *Dactylorchis, Petrorhagia* for *Kohlrauschia.*

At the modest price asked for Mr. Keble Martin's flora, which works out at a dime per plate, the publishers could clearly not afford those costly methods of reproduction which alone ensure exact tonal veracity in color work. As often happens, the browns and yellows come off best, true and brilliant, and the pinks and reds are hardly less successful. Blues and purples tend to be a little muted or even a little off, and among the greens, so characteristic of plant species and therefore so important for botanical illustration, there is a disturbing emphasis on the yellow component in the pigments. However, this "yellow shift" is consistent, and the eye quickly accepts it as a convention. In other repects, the book is beyond criticism.

The days are long gone when a Sowerby, in the celebrated first edition of English Botany, could devote a whole folio page to a hand-colored engraving of the tiny, jewel-like *Gentiana nivalis.* However, Mr. Keble Martin's version of the same (Pl. 59) is hardly inferior, even though it enjoys a less spacious setting. Botanical illustration is not a dead art so long as the talent is still here; its need is an informed public. The Concise Flora has become a best-seller in England, demonstrating, I think, that a book conceived in truth and executed with a delicate and artful perfectionism can enjoy wider appreciation than its subject, unadorned, can command in ordinary circumstances. A flora of England cannot be considered useful in America, but a book of this quality has a universal appeal. I urge you to buy it and enjoy its beauty.

R. C. Barneby

THE GREAT AMERICAN FOREST. Platt, Rutherford. 271 pages, illustrated, indexed. Prentice-Hall, Englewood Cliffs, N. J. 1965. $6.95.

To present an objective evaluation of a nontechnical book on nature is usually a matter of interest in and familiarity with the subject, of preference and temperament. Even to one initiated in things natural, many such books are shallow, unimaginative, repetitious, and boring. Much of the success of literature on natural environment lies primarily in fluent writing as expected in outstanding novels, in accuracy on a necessary scholarly plane, in imagery approaching poetic levels (but not exclusively so, or overdone) to hold the reader's sustained interest. The final test is that one cannot put the book down until it is read to the end. If these criteria are met, then every naturalist will wish to become acquainted with the volume. Even if the book offers nothing new but the refreshing approach, all interested readers will benefit, will be re-stimulated, and, against all external "civilized" pressures in the opposite direction, will become reassured that they are on the right path which is the emphasis on the preservation of our natural heritage.

In *The Great American Forest,* all these commendable qualities are unequivocally maintained. Careful selection of the seventeen chapters reflect the author's knowledge of highlights and urgency of the subject. They are skillfully arranged in logical sequence from "Wilderness Traces," "Discovery," "The First Forests" (now fossil) to the finally "Vanishing Wilderness." In these and other parts of the book, the reader cannot but experience a mood of receptiveness to the unpretentious, silent eloquence of nature. Many who are unable to put such sensitive feelings into writing, or prefer to harbor them within for the peace and nourishment of the spirit, will equate the subtle message with the writings of Thoreau, John Muir, or with the more recent, but no lesser thoughts of Fritiof Fryxell *(The Tetons)*; Sally Carrighar *(One Day at Teton Marsh, Moonlight at Midday)*; or even Rachel Carson's *The Sea Around Us* and *The Edge of the Sea.*

Perfection in writing is an elusive concept, perhaps not even desirable, and certainly not easily sustained. A few asonant notes, therefore, can only enhance the composition by pointing out the human qualities of the writer. Botanical and geological mistakes are few, relatively unimportant, and easily overlooked by the nonprofessional reader. The book will doubtless fulfill the esthetic needs of all who have walked and lived in the woods and forests, and hopefully stimulate those hitherto not so fortunate in this rare experience.

Herman F. Becker

THE BIRD WATCHER'S AMERICA. Pettingill, Olin Sewall, Jr. (ed.). 441 pages, illustrated. indexed. McGraw-Hill Book Company, New York. 1965. $7.50.

This is a wonderful book for browsing, for checking up on sections of the country with which one is familiar, and, by all means, for taking along on a leisurely automobile trip through the United States and Canada.

In the Introduction, the editor quotes from a letter of explanation to the authors who were chosen for their enthusiasm for special areas: "The book is aimed at the audience of bird-watchers who, knowing the commoner species in at least their home region, are ready for encouragement in seeking other places for different birds." "When possible, the author should point up opportunities for investigation, so as to provide a challenge."

There are forty-six heretofore unpublished essays by forty-four authors, the majority well known in ornithology, wildlife management, natural history, or conservation. They are teachers, novelists, newspaper columnists, businessmen, and housewives. All have in common an "insatiable love of finding, studying, and enjoying birds in natural environments and the great ability to write about it." The editor knows many of them personally as is shown in his biographical sketches at the beginning of the chapters.

The essays cover the following environments: Atlantic Coast and Coastal Islands, Eastern Mountains and Foothills, Pacific Coast, Western Mountains and Foothills, Alaskan Islands, The North Country, The Wetlands, Prairies, Deserts, Desert Mountains and Canyons, The Lower Rio Grande Valley, Migration Spectacles, and Some Avian Specialists.

The one or two pen and ink sketches illustrating each chapter are beautifully done by John Henry Dick. They certainly set the stage for the writings.

The index is especially good in that it is subdivided under each subject into the separate states of the United States and the provinces of Canada.

Probably one's greatest enjoyment in

the book comes from chapters describing places one knows best, such as "Finches of the High Rockies," or "Bonaventure Island," or "Hawk Mountain Sanctuary." I laughed out loud when reading of John and Mary Schmid at Churchill on Hudson Bay. They give delightful, illustrated lectures at bird-banding meetings. Places are described to which I have longed to go, such as "At Block Island in the Fall." Many new places are pictured which create a great desire to visit: Point Pelee, Canada, in the western corner of Lake Erie, or The Lower Rio Grande Valley, or Big Bend National Park in Texas. Other places are described to which only the hale and hearty experts will doubtless travel: the Aleutians, the Pribiloffs, Arctic Alaska, and the Great Dismal Swamp.

Although most chapters picture the various birds of a certain location, others pinpoint a single species, as "The Trumpeters of Red Rock Lakes," "In Kirtland's Warbler Country," "Golden-cheeks of the Edwards Plateau," and "The Cranes at Last Mountain Lake."

The migration of skeins of birds against the sky is vividly described in "Geese Along the Missouri."

GRACE COIT MELENEY

FLORA OF TURKEY — Volume 1. Davis, P. H. (ed.) 567 pages, 30 maps, 20 figures, indexed. Edinburgh University Press, distributed by Aldine Publishing Co., Chicago, Ill. 1965. $27.50.

This Flora, Volume 1 of eight volumes, was needed; it is the first flora to cover this region since Boissier's *Flora Orientalis,* which was completed in 1888. Boissier's flora has been valuable, but it is out of date, for much more material and information have been collected. It is also timely that the Turkish flora should be written up while work is in progress on *Flora Europaea, Flora Iranica,* and the *Flora of Iraq.*

A Turkish Flora is important for there are three major phytogeographic regions within that country which give rise to a diversity of vegetational types. The eastern Aegean Islands Flora has wisely been included, since it is not included in *Flora Europaea,* and it is closer to that of Turkish Anatolia.

The general arrangement follows that of Boissier's work. The first volume treats the Pteridophyta, Gymnospermae, and families of Dicotyledons from *Ranunculaceae* to *Polygalaceae.* This is just over nine hundred species, of which about twenty per cent are endemic to Turkey.

The introduction to this work has valuable information about the geography, topography, climate, and phytogeography of Turkey, which is basic to an understanding of the region. It carefully explains the layout of the rest of the work and, as far as possible, the basis for the recognition of the various taxa. Wisely this work uses only two infra-specific taxa, subspecies and varieties.

The descriptions of the families, genera, and species are clear and concise. Although they are written by many different authors, they are well edited to give uniform terminology. The description of the species are followed by information on synonomy, types, ecology, distribution including that outside Turkey, citation of specimens, and notes on variation, affinities, and other points of interest. There are also good references to other important works. The keys to families, genera, and species are clear, well set out, and easy to use. This work is, in fact, a revision of the plants of the region. Its high standard should make it rank with Boissier's Flora as a landmark in our knowledge of the plants of Turkey.

GHILLEAN PRANCE

THE HARVEST THAT KILLS. Coleman-Cooke, John. 207 pages, indexd. Odhams Book Ltd., London. Distributed by Transatlantic Arts, Levittown, N. Y. 1965. $6.75.

This excellent sequel to Rachel Carson's *Silent Spring* is based largely on experiences and observations of the harmful effects of pesticides in Great Britain.

P. P. PIRONE

INTRODUCTION TO THE FLOWERING PLANTS OF WEST AFRICA. Nielsen, Margaret S. University of London Press, London. Distributed by Edwin A. Menninger, Stuart, Florida. 1965. $6.50.

A teacher of botany in Nigerian schools who became acquainted, by experience, with the enormous gap between ordinary botany textbooks and the amazing complexity of tropical plant life, has attempted to bridge this gap for the earnest student. Nearly eight thousand species of flowering plants grow in West Africa, and the author has skillfully selected six hundred of them to illustrate the path to be followed by teacher and student in that area. The plants selected are those economically or ecologically important, those commonly seen, or those having distinctive features. Most of the detailed drawings are by the author. A well-organized key to the plant families should be most useful to a student.

EDWIN A. MENNINGER

INTRODUCTION TO BOTANY. Bowen, H. J. M. 216 pages, illustrated, indexed. Arco Publishing Company, New York, New York. 1965. Cloth $3.50, paper $1.65.

This is a valiant but only partly successful attempt to cover the essentials of botany in a pocket-sized book directed to the novice. The author, a lecturer in chemistry at the University of Reading, in England, has tried to take proper account of recent as well as traditional work and ideas in botany, but the book is beset with small errors and near-misses which suggest that he has not thoroughly digested his massive meal. There are, nonetheless, many interesting nuggets in the author's breathless but readable race through the botanical forest.

ARTHUR CRONQUIST

A FLORA OF NORTHEASTERN MINNESOTA. Lakela, Olga. 541 pages, illustrated, indexed. University of Minnesota Press, Minneapolis. 1965. $10.00.

Students who must use a regional flora to identify plants often wish for a local manual instead, so that the keys would be simpler and they could avoid the frustration of trying to find out why their specimen keyed out to something that does not occur within five hundred miles of the place. Dr. Lakela's flora meets this need for northeastern Minnesota. It has keys, descriptions, and dot-maps. The nomenclature mostly follows that of Gray's Manual, without synonymy. Professional botanists will probably prefer to use one of the regional floras, but students and amateurs who want to identify their specimens with the least difficulty will doubtless find this flora useful.

ARTHUR CRONQUIST

FLOWERS OF THE MEDITERRANEAN. Polunin, Oleg and Anthony Huxley. Viii + 257 pages, illustrated (part color). Chatto & Windus, London. Distributed by Edwin A. Menninger, Stuart, Florida. 1965.

Travelers who will touch shore communities or visit classic sites bordering the Mediterranean will find this a useful book, for the authors have assembled descriptions of the seven hundred plants most likely to be seen and have illustrated most of them with their own color photographic close-ups and 128 line drawings. Up-to-date botanically, the book nevertheless avoids technical jargon and will appeal to the average tourist who wants acquaintance with things which grow in this warm area, where killing frosts are rare and winter mean temperatures are in the 40°s or 50°s.

EDWIN A. MENNINGER

THE AMERICAN CAMELLIA YEARBOOK 1966. Pyron, Joseph H. (ed.). 345 pages, illustrated. American Camellia Society, Box C, Tifton, Georgia. Membership in the Society.

A rather small group of camellia enthusiasts came together in 1945 to form an organization to promote interest in the cultivation of the genus *Camellia.* From that small beginning twenty-one years ago, the American Camellia Society has become one of the largest and most important plant societies.

One of the finest products of this Society is its yearbook. The first was issued in 1946, and there has been an annual publication since then. These twenty volumes (1962-63 were combined) make a very splendid library on every phase of camellia culture.

The 1966 Yearbook is a fitting climax of the twentieth anniversary celebration of the American Camellia Society. The yearbooks have made consistent improvement over the years, as is evident when one compares some of the early volumes with this current publication. One of the important articles in the 1966 Yearbook, entitled "Interspecific Camellia Hybrids" by Dr. P. L. Hilsman, is more scientific than earlier articles. Dr. Hilsman has given the results of his study of hybrids of unknown origin and hybrids of known origin, and the material will be of great interest and help to amateur camellia breeders. It is only one of the many fine articles valuable to camellia growers.

The last chapter presents the results of the Arrangement Contest. Photographs from many camellia shows are accompanied by the names of those who won awards.

The 1966 Yearbook is profusely illustrated with some colored plates, many interesting black and white photographs, and some lovely line drawings.

JUNE R. HENDERSON
Aiken, South Carolina

BRIEF NOTES ON RECENT BOOKS

FLOWERS

FLOWER PORTRAITS. Mannering, Eva (ed.) 14 pages, color plates (I-XVIII). Taplinger Publishing Co., New York, N. Y. 1966. $12.95.

The flower portraits of six masters of the seventeenth to nineteenth centuries—Walther, Ehret, Redouté, Andrews, Sowerby, and Mrs. Withers—and of three modern botanical painters—Jones, von Riefel, and Margaret Stones—have been beautifully reproduced in this volume.

The editor has written an interesting Foreword and biographical sketches of all but Sowerby and Mrs. Withers, on whom no dates are available. The line drawings by Susanne Kolasse are exquisite.

Originally published in 1961 by The Ariel Press, London, it is now available in this country from Taplinger.

FLOWERING BULBS FOR WINTER WINDOWS. Walker, Marian C. 107 pages, illustrated, indexed. D. Van Nostrand Company, Inc., Princeton, N. J. 1965. $4.95.

From her own long-time experience in window gardening, Mrs. Walker gives clear directions on forcing tulips, hyacinths, narcissi, lilies-of-the-valley, amaryllis, and other bulbs. The flowering schedules are based on her acute observations, and most of the photographs were taken in her home. Novices in gardening who dwell in urban or suburban apartments or homes will find this a helpful little book.

GARDENING DAY-BY-DAY. 1966. Rawnsley, Ellis. Unnumbered, illustrated. Diversity Books, Kansas City, Mo. 1965. $2.50.

This calendar not only offers helpful what-to-do- and how-to-do-it hints, but other informative comments—to wit: "Bird authorities recommend making a little fine sand or ground charcoal available to wild birds—either separately or mixed with bird food," and "Keep logs and kindling outdoors until you're ready to feed the fire. Lots of insects find winter haven in log piles, and may thus be warmed into activity if logs are stored indoors for any length of time."

The black and white photographs are on the whole, good; the occasional line drawings decorative.

FLOWER ARRANGEMENT

CONSIDER THE LILIES. Martin, Alfreda "Oko". 109 pages, illustrated (part color). Charles E. Tuttle Co., Rutland, Vt. 1965. $5.00.

An introduction to the art of Japanese flower arrangement, explaining the theory and techniques in a clear and simple style. The author and her husband, whose photographs illustrate the book, have been missionaries in Japan for the past fifteen years. She was a student at the Sogetsu School in Tokyo, her professional name "Oko" being given to her by Dr. Sofu Teshigahara, the Dean, because of her proficiency in the art.

An unusual feature are the Biblical and devotional passages appropriate to the season.

CONTEMPORARY TABLE SETTINGS. Kroh, Patricia. 192 pages, illustrated (part color), indexed. Doubleday & Company, New York, N. Y. 1966. $7.50.

An attractive and well-designed handbook on the art of table setting, with easily followed step-by-step instructions on arrangements with flowers and fruits, and a section on party planning, including menus.

Mrs. Kroh writes from personal experience. An accredited flower show judge of the National Council of Federated Garden Clubs, she has won tricolors and blue ribbons for table setting and artistic arrangements, and has written newspaper and magazine articles on the subject. Her husband, Milton Freudenheim, deserves credit for the fine photographs which illustrate the book.

HOLIDAY FLOWER ARRANGEMENTS, Revised. Cyphers, Emma Hodkinson. 129 pages, illustrated (part color), indexed. Hearthside Press, Inc., New York, N. Y. 1965. $4.95.

As the title indicates, this is a revised edition of *Holiday Flower Arrangements*, originally published in 1954. A chapter, "Modern Abstract Design" and over forty new pictures have been added.

GARDENING

THE GARDEN BOOK (House & Garden). Harling, Robert, Peter Coats, Alex Kroll, (eds.). 256 pages, illustrated (part color). St. Martin's Press, New York, N. Y. 1966. $22.50.

A book about gardens and gardening in England but one which will delight gardeners in America as well. It is profusely illustrated in black and white and color, and ideas for one's garden can be gleaned from them as well as from the text, bearing in mind, of course, that climatic and other conditions which affect gardening are not the same in both countries. This qualification applies especially to "The gardener's year" which occupies the last sixteen pages of the book.

THE GLORY OF THE GARDEN. Strong, Patience. 176 pages, illustrated. Leisure Time Books, New Rochelle, N. Y. 1966. $3.00.

The Glory of the Garden is once more available. This charming little book, published in 1946, has recently been reprinted by popular demand. The author's refreshing philosophy is set before the reader as in a diary. Here are a few of her lines dated April 1st:

"April! Magic, evocative word, beloved of poets throughout the ages. Shakespeare's month: month of rainbows and primroses, lilac and apple blossom . . . To the townsmen it means daffodils on a street barrow and tulips in the parks. To the countryman it means the cuckoo and the cowslip, green hedges and golden meadows. To the gardener who works and dreams all winter for the coming of this sweet month, it means something more than fulfillment of hope. It is seed-time. . . ."

GARDEN IDEAS (Better Homes and Gardens). Neff, Guy (ed.). 162 pages, illustrated (part color). Meredith Press, Des Moines, Iowa. 1966. $1.35.

Current trends in landscaping are emphasized in the *Better Homes and Gardens* annual for 1966, and plans for many of the landscaping projects may be had from the publishers at $2.00 each and less. Other topics on which useful information is given are annuals, perennials, trees, shrubs, vines, fruits, vegetables, lawns.

NATIVES PREFERRED. Dorman, Caroline. 217 pages, illustrated, indexed. Claitor's Book Store, Baton Rouge, La. 1965. $5.00.

The author is a horticulturist of note and widely known through her correspondence with horticulturists and gardeners throughout the country. She has written a delightful book about native trees, shrubs, and herbaceous plants—where and how they can be grown and equally important where they cannot be grown. Her style is pleasing, her pen and ink sketches lovely, good portrayals of the particular plants. It is unfortunate that in the printing some of the fine lines are indistinct. At the end of each chapter is a useful summary.

MODERN ROSES. 497 pages, illustrated (mostly color), indexed. The McFarland Company, Harrisburg, Pa. 1965. $19.50.

This sixth edition of *Modern Roses* represents a check list of rose names prepared in cooperation with the American Rose Society, which is the International Registration Authority for the genus *Rosa*. Each name is accompanied by a condensed description.

GOLDFISH POOLS, WATER-LILIES AND TROPICAL FISH. Thomas, G. L., Jr. 336 pages, illustrated (part color), indexed. T. F. H. Publications, Inc., Jersey City, N. J., distributed by Sterling Publishing Co., New York. 1965. $7.95.

A new chapter on tropical fish has been added and other parts updated in this book which was originally published by D. Van Nostrand, Princeton, N. J., in 1958 under the title of *Garden Pools, Water-Lilies and Goldfish*.

Handbook on Roses, published by the Brooklyn Botanic Garden is available from that institution at $1.00 per copy. The Guest Editor, Sidney B. Hutton Sr., enlisted seventeen outstanding rosarians in this country and abroad as contributors. Among the features is a comprehensive and easily understood descriptive key to rose classes by Dr. Raymond C. Allen.

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THE GARDEN JOURNAL

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THE GARDEN JOURNAL

DOROTHY EBEL HANSELL, *Editor*

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PACKAGED SUNSHINE

By Richard M. Klein

Dr. Klein is Alfred H. Caspary Curator of The New York Botanical Garden.

The advice of Prof. H. H. Clum, Marco P. Stufano, Pamela Edsall, Dr. Eva Hawkins, Dr. Deana T. Klein, and John Wells is acknowledged with gratitude. The drawings were made by Charles C. Clare.

There are many advantages to living in a city. Shopping is easier, plays and concerts are more readily available, and communication is generally more rapid. There is, however, one serious drawback; the city is a difficult place in which to grow plants. Any apartment dweller can testify that apartments are too hot, too dry, too dirty, and, above all, have too little light. For these reasons, many have given up the attempt and use plastic "plants" for a spot of soothing greenery.

In part, this withdrawal is conditioned by the presumed difficulty in obtaining decent-looking containers in which plants can be grown under artificial light and, based on the telephone calls and letters I have received over the past few years, there is also considerable confusion on just what lighting for plants is all about. In this article I shall attempt to cover both these major questions. However, for convenience, it is better to reverse the order and discuss light and plant growth before discussing plant-growth systems.

What we call light is really only a small portion of the electromagnetic spectrum. This spectrum (see Fig. 1), extends from the powerful X- and gamma radiation through the ultraviolet, then the visible (light) region and out through the infrared (heat) to microwaves and the radio and television wavelengths (Matt Dillon, etc.). The term "light" is really somewhat misleading, because it is based on what can be detected by the human eye. If, for example, mosquitoes were the dominant life form and had language, they would refer to the ultraviolet as light because that is what their eyes perceive. The point of this is that plants don't have eyes and the radiations or wavelengths which are important for their growth and development do not necessarily have anything to do with what we see.

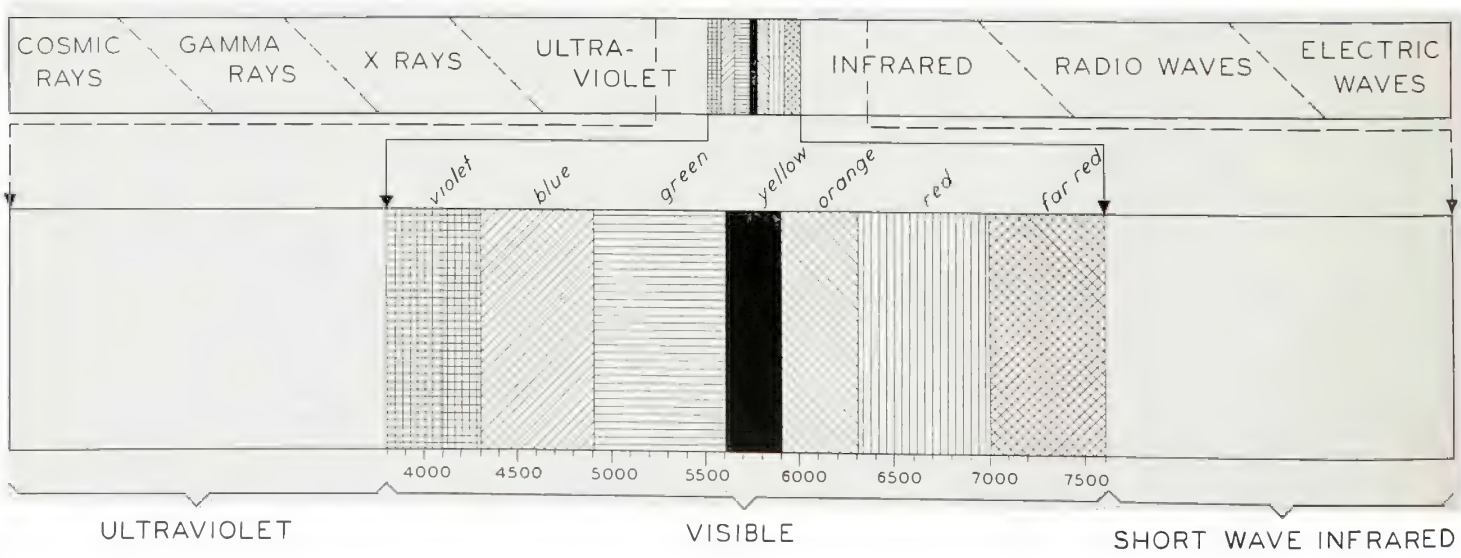
It is obvious that color, too, is based on human experience and convention and need not have any significance to a plant. In spite of its extreme sensitivity, the human eye is a poor color discriminator in the physical sense. The human eye is most sensitive to what we call green light and sensitivity falls off rather abruptly in the blue and in the red (Fig. 2). This means that we tend to judge intensity on how much of the light is in the green region of the spectrum. This is one of the reasons that Cool White fluorescent lamps look brighter than incandescent lamps—they have a large proportion of green wavelengths.

Factors in Lighting Plants

In any discussion of light as it affects plant growth, there are always three factors which must be considered. These are *quality,* which refers to the color composition of the light; *quantity,* which refers to the intensity of the light; and *duration,* which refers to the amount of time that the lights are on or off based on a twenty-four-hour period.

In spite of any personal wishes, people will continue to think of light in terms of color, so it is useful if we can establish a standard naming system. The visible part of the spectrum runs from the violet into the far red. In physical terms, violet radiations have wavelengths centering about 4000 Ångström units, and the far red radiation centers about 7500 Ångström units. Blue light is 4200, green is 5400, and red is 6500 Ångström units. The other colors are intermediate values. Figure 1 shows the electromagnetic spectrum with color designations and Ångström unit designations. I shall use color designations throughout.

Figure 1. The electromagnetic spectrum.



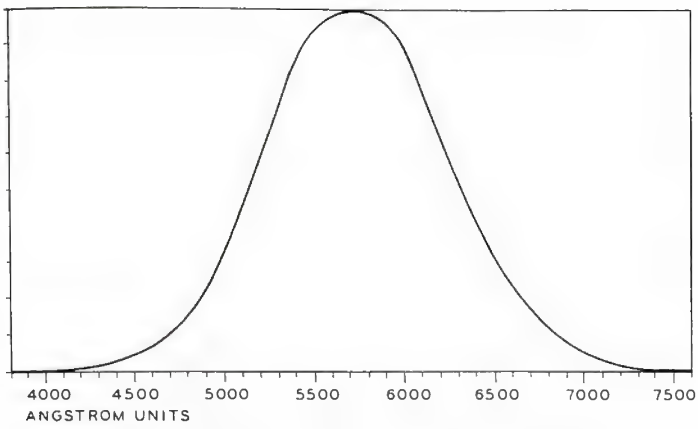


Figure 2. The relative efficiency of the human eye in "seeing" different colors.

One more important point is needed as part of our basic collection of information, and that is the question of energy. Light has energy, and under the proper conditions the energy of the light can be transferred to the living cell. Certain of the activities of plants require a good deal of energy, while other activities need very small amounts. The light energy from the sun is the primary source of power (another way of looking at energy) on the earth. Not only does the sun supply energy as heat, but it supplies light which, like heat, can be converted into energy. In fact, light wavelengths have more energy per unit than do heat wavelengths.

Summing up the preceding physical information: The energy we perceive as light comprises a small portion of the electromagnetic spectrum and light can be further subdivided into wavelength bands which we call different colors. In its relation to plant growth, the duration, quality, and quantity of light are all important in determining how plants grow.

Independent of the quality or the duration of the light, we know that some plant processes can occur ("go" in the biophysicist's term) only when the total light is high enough to supply the total energy requirements for the process. The prime example of a high energy process is photosynthesis in which the amount of sugar formed by the plant is dependent upon the amount of light supplied. With certain reservations to be mentioned later, this is why the indoor gardener tries to grow plants under fairly bright light, for under dim light conditions the plant simply cannot make enough sugar to keep it growing.

Although usually neglected by many people, plants have special requirements for small amounts of light of very particular colors. These low light energy processes are the ones which determine whether the plant will have its normal shape or whether it will be too tall and spindly, or have small leaves, or even fail to flower. Photobiologists have developed the term photomorphogenetic (the control of plant form by radiation) to cover these low light energy reactions.

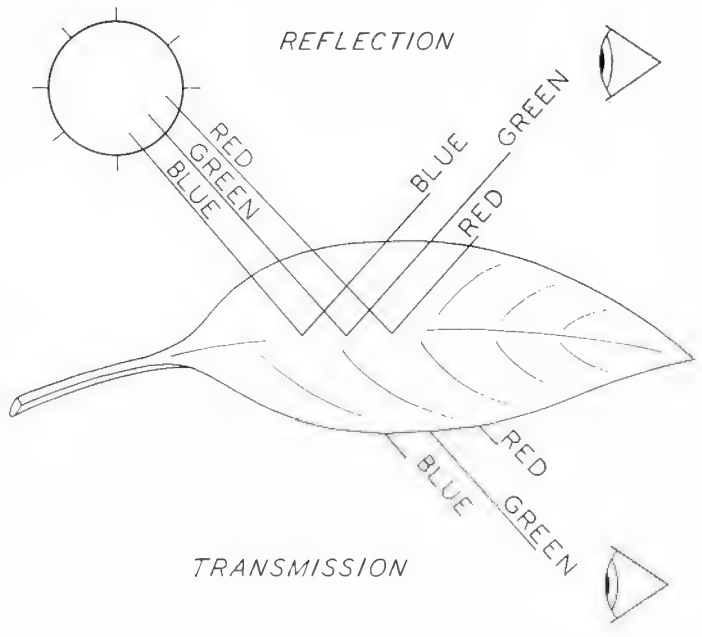
As you would suspect, all this leads to the statement that for both high light energy and low light energy reactions in plants, the quality, quantity, and duration of illumination must be considered.

High Energy Requirements

Let's take the high light energy reactions first, for these are the ones which determine whether the plant can carry out photosynthesis at a rate sufficient to permit the formation of an adequate amount of sugar for its nutrition. Without going into the fascinating details of the process of photosynthesis, we now know that both blue and red light are necessary for optimum efficiency of the process (Fig. 3). Essentially, the green chlorophyll molecules absorb blue and red wavelengths from white light (such as light from the sun) and transform the light into effective wavelengths which are actually in the red and the far red (a rather ugly puce color to the eye). Since blue and red wavelengths are absorbed by the chlorophyll, and associated carotene-like pigments, a leaf looks green because the green wavelengths are not absorbed and are either transmitted through or reflected from the leaf (Fig. 4). This then is the first part of our necessary factors, that of quality.

The second radiation factor, that of quantity, necessitates bringing in another idea. For photosynthesis to occur there must, of course, be light, but water and carbon dioxide must also be supplied. Since the entire process of photosynthesis results in the formation of sugars from the carbon dioxide, the amount of this gas in the air limits the amount of sugar formed, and even if a tremendous amount of light is supplied, the amount of sugar will still be limited by the amount of carbon dioxide. Normally, aside from a smoggy street corner, there is only about 0.03% carbon dioxide in the air. Thus, beyond a certain upper limit, additional light is wasted. Except for a few special plants, light above about 1000 foot-candles is not used for photosynthesis. An analogous situation is found in baking a cake. If each layer requires two eggs, a cup of sugar, and two cups of flour, and you have four eggs, you can bake

Figure 3. The reflection and transmission of sunlight from and through leaves.



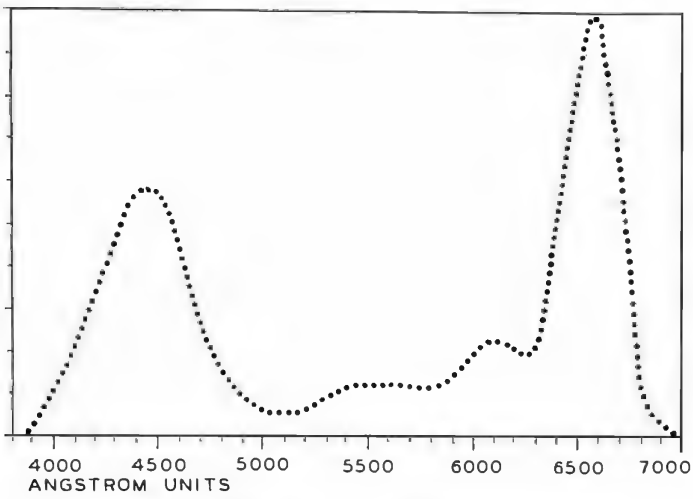


Figure 4. The efficiency of different colors of light in photosynthesis.

only a two-layer cake no matter how much sugar and flour you have. From Figures 2 and 3, green light, which we see best, is almost completely unused in photosynthesis. Unfortunately, the standard Cool White fluorescent lamp has its highest irradiance in the green and, for photosynthesis, is relatively inefficient. For this same reason, the very bright mercury vapor lamps used for street lighting—which are basically green radiating —should not be used as the primary energy source for plant growth.

Having indicated that blue and red light are photosynthetically active and that very high intensities are wasted, we can turn to the third factor, that of duration. Here the picture is somewhat confused. One would assume that an adequate level of the needed colors of light, if presented continuously, would result in efficient use of the available carbon dioxide and the plants would be able to make sugars around the clock. There are a few horticulturally important plants which can be grown on a twenty-four-hour photoperiod, but most plants do not do well under these conditions. It isn't a question of being "unnatural," because a state of nature is not necessarily the best environment. We just don't know why most plants need a period of darkness for best development.

Duration can, however, be controlled. The inventor of the Bunsen burner, used in all laboratories, found that many light-controlled reactions would proceed to the same point with low light for a long period of time or with high light for a shorter period of time. Although this Bunsen-Roscoe Law is only partially applicable to plant photobiology, it does have some theoretical and practical use. If the available light is of low intensity or of low composition in the required wavelengths (which amounts to the same thing), increasing the duration of exposure can result in enough photosynthesis to supply the needs of the plants. In practical terms, this means that if you have plants in a location where they get relatively little sunlight, as on a window sill partly blocked by another building, supplementary illumination in the evening may be useful.

There is no need to document here the studies which show that the reproduction of many plants is controlled by the relative proportions of light and darkness. Many of the available books on gardening and on artificial light culture of plants have at least mentioned the background of photoperiodism, and most of them give lists of long- and short-day requiring plants. For the most part, these lists are correct and can be followed with confidence.

It is, however, valuable to note that darkness means just exactly that. Merely moving a plant from high light conditions to a dimmer spot in the room is not adequate; the photoperiodic responses are low light energy reactions, and there is usually a sufficient level of the required wavelengths even in a very dim room to upset the delicate internal mechanisms which control flowering. The plants must be placed in absolute darkness. Cardboard boxes are excellent; so is covering with black cloth. The black polyethylene used for outdoor mulching of plants is not opaque and at least two thicknesses are required.

For many plants grown for foliage and for their soothing green color, flowering is not important. Foliage plants can be grown under twelve to sixteen hours of light per day. Lower light periods are satisfactory when the intensity of the light is high but, remembering the Bunsen-Roscoe rule, longer lighting periods are desirable when the intensities are lower.

Even though I'm exposing our ignorance, I must mention that plant physiologists are aware that some plants thrive on or even require low light intensities—intensities far below that necessary to saturate the photosynthetic system. Some of the ivies and many of the small summer annuals growing on the forest floor are examples of shade plants. At this time, we really haven't any idea of why this should be the case. This is one of many examples of the need for a cooperative investigation between horticulturists and scientists—a mutual activity which has received lip service and very little more. The G. W. Park Co. of Greenwood, South Carolina, has a very useful booklet, *Growing Plants Under Lights,* which lists high and low light plants.

There are a few other high light energy reactions in plants, but they are very specialized, and it is necessary only to note that adequate levels of illumination for photosynthesis usually are sufficient.

Low Energy Requirements

We can now turn to the discussion of low light energy reactions, a topic which is just beginning to be understood and which has scarcely entered the gardener's field of knowledge. This is unfortunate, because some of the more fascinating areas in plant science today involve low light energy reactions. When discussing low light energy reactions, it is important to remember that the light energy is itself not sufficient to cause the change in the plant; the light is of too low intensity and is required for a very short period of time. You can think of these light reactions in terms of a loaded rifle. It requires a certain amount of pressure (energy) to pull the trigger, but once pulled, the reactions in the shell, which result in the ejection of the buckshot, use another

source of energy, namely the charge of gunpowder. In low light energy reactions, the light is the pressure on the trigger, the explosion of the gunpowder is an internal reaction, and the morphogenetic (form change) results are equivalent to the ejection of the buckshot.

Even a listing of the currently known low energy light reactions would require almost a full column of print. Some of them, although vital to the proper functioning and development of the plant, cannot be detected except with research instruments. Others are so obvious, as you will see, that most of us have seen them many times and have learned how to use them for our own purposes. Actually, many really good gardeners will tell you that "they knew that from their cradle," even though they couldn't put it into words.

As you now know, the same three factors must be considered when discussing these low light energy reactions, but the quality factor has proved to be the most important. The different colors (wavelengths) of light have very different effects on plant growth and, for proper plant development, all must enter into any good design for the artificial lighting of plants.

In order to obtain a general idea of what colors of light do affect the growth of plants, it is convenient to discuss the different colors in order.

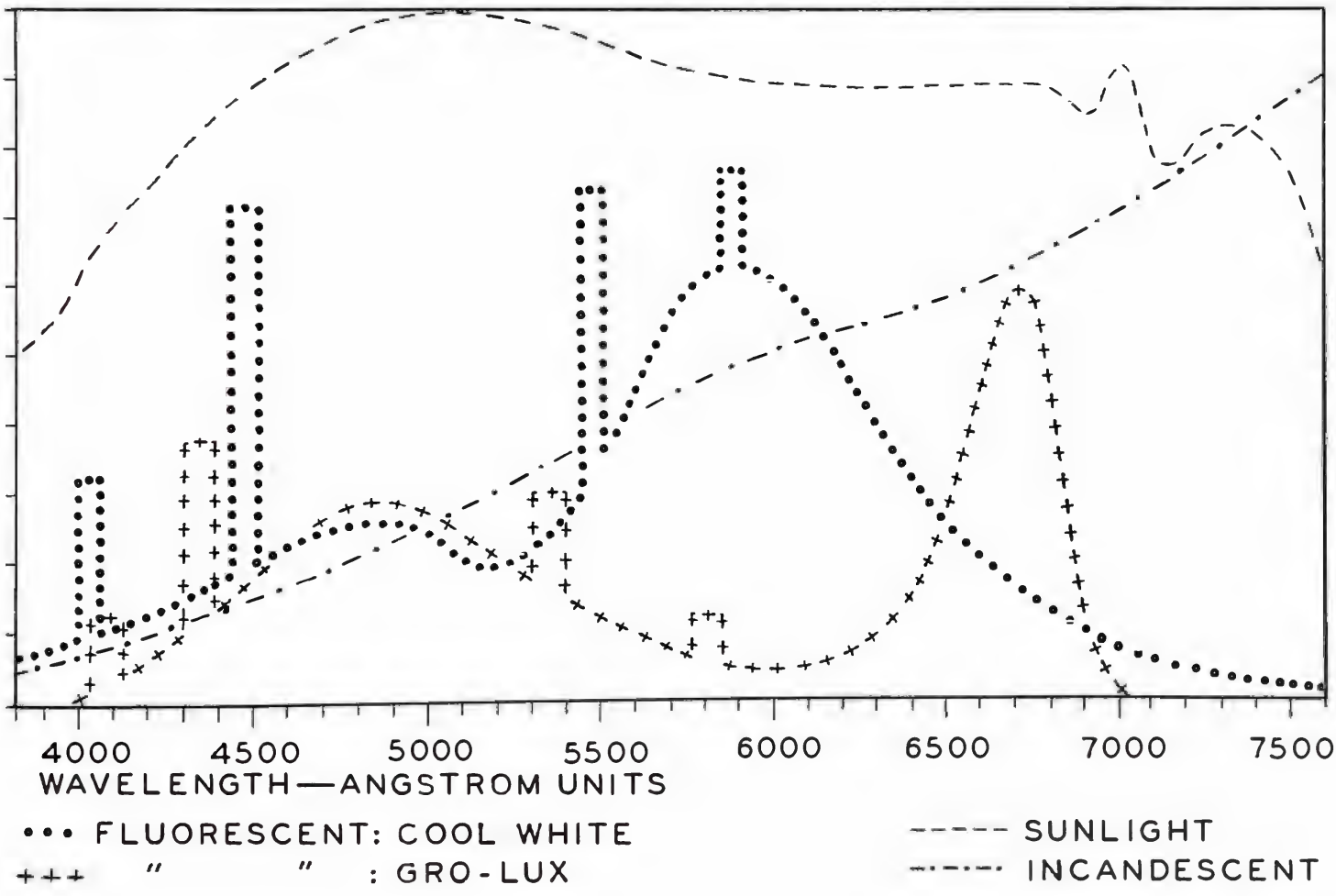
Ionizing Radiation

Although there is a considerable amount of the more energetic ionizing radiations which reach the earth, so little can be done about them by the home plant grower that we can forget about them. It is likely that a fair number of mutations (sports) which are picked up by professional and amateur plant growers are due to these radiations. Some of these sports are of horticultural value, others may result in malformation or death.

Ultraviolet Radiation

It is fortunate that the more damaging of the ultraviolet radiations don't reach the earth. Several miles above the surface, a series of layers of water vapor and ozone screen out much of the ultraviolet radiation. Research in my laboratory, as well as in others, has demonstrated, however, that at least one of the wavelengths which does penetrate to the earth is rather damaging to plant growth. We now think that this ultraviolet radiation interferes with cell division. This is an interesting statement which, at first glance, has little to do with the subject of this discussion. However, if you look at the spectral energy emission curves for the fluorescent lights (Fig. 5), you will see a small spike or peak in the near ultraviolet between 3500 and 4000 Ångström units. This spike is present in the radiation emitted by virtually all fluorescent lamps (including Cool White and Gro-Lux lamps). It is just plain unfortunate but this mercury excitation line is precisely the one that is damaging to plants. Of course, it is rarely of

Figure 5. The emission of visible light from the sun and from the three most commonly used sources of artificial light.



sufficient intensity to cause plant death, but it does mean that the value of fluorescent lamps for growing plants is somewhat less than would otherwise be the case. Since it forms a greater proportion of the radiation which hits plants than in sunlight, it is correspondingly more damaging.

At this time, this near-ultraviolet radiation (we can't call it light because we can't see it) is not being eliminated by any of the manufacturers of lighting equipment. It can, however, be easily filtered out by interposing a sheet of Mylar-W plastic (a du Pont product designed for other uses) directly below the lamps. Perhaps one of the more enlightened companies will put a UV-retarding coating on fluorescent lamps; for, with removal of this wavelength, we have found striking increases in the growth of all sorts of plants from corn to marigolds.

Blue Light

You are familiar with one of the more striking responses of plants to blue light. If plants are kept on a window sill with the light coming from only one side, there is a pronounced tendency for the plants to bend towards the source of illumination. To avoid this, it is common practice to rotate the plants, giving them a quarter or half turn each day. In this way, the unilateral effects of the blue component light on bending are essentially nullified and the plant tends to grow upright. Of course, there are always exceptions to this rule, the most notable being the negative reactions of some of the climbing ivies, where the plants seem to become more closely appressed to the wall as the light becomes strictly unilateral. Other effects on plants are caused by blue light, but these need not concern us here. Some are very special, applying to only one or a few plants, others are of little horticultural interest, and still others are the result of experimental conditions which are unlikely to be duplicated in gardening under lights. This does not mean that they are unimportant; indeed, theoretical work on radiation will eventually have considerable application to practical problems.

Green Light

We have already noted that green light is not very effective in photosynthesis. It was this fact which prompted the development of the Gro-Lux and Plant-Gro lamps. The manufacturers actually did a bigger service than they realized because green light, like near-ultraviolet wavelengths, is damaging to plants. For most plants, it is much less damaging than the near ultraviolet but, since the standard Cool White lamps are very high in the green region (after all, they were designed primarily to see by), there is a sufficient amount to reduce plant growth. Since it is rather difficult to filter out the green light from Cool White lamps, it might seem that the Gro-Lux type would be better for growing plants.

Even this assumption may not be true for several reasons. The first reason is the relative expense of the special lamps compared to Cool White lamps. The second reason is that the growth depression in the green region is rather small and would probably not be perceptible under ordinary circumstances. The third reason is that the even more growth-depressing ultraviolet is just as intense in the Gro-Lux as it is in the Cool White type. The fourth reason is that the color of the Gro-Lux type is not particularly pleasant and is far from flattering to human skin.

Red Light

The bulk of scientific excitement in photobiology today centers about red light. A great deal of the excitement is due to the fact that after many years of painstaking research the pigment that absorbs red light has been isolated from plants. This has permitted a burst of work on the whole problem of how and why plants are so responsive to red light.

To permit evaluation of red light in plant growth, it is necessary to fall back on that favorite literary device, the flashback. For at least forty years it has been known that plants grown under dim light conditions or in full darkness are yellow, very tender, full of water (succulent), and usually tall and spindly. Many eminent scientists found that exposure of these etiolated plants to even a few minutes of sunlight resulted in the formation of the photosynthetic pigment, chlorophyll, a reduction in succulence, expansion of leaves, changes towards the light-grown condition in the internal tissues, and even a reduction in the amount of excessive growth. If the plants had been initially dark-grown, the effects were even more pronounced and dramatic. Note that the light was required for just a short time and that the effects were seen days after the exposure. With the development of filters, monochrometers, and other equipment, it was found that the effective color was red.

Even more dramatic was the finding that if the red light was immediately followed by exposure to far red light (which can scarcely be seen), the effects of the red light could be lessened or even negated. As an example —certain cultivars of lettuce seeds will not germinate unless they are given red light. If the red light is followed by far red light, they will not germinate. If an alternating sequence of red- far red- red- far red . . . . is given, the last light color given will determine whether the seeds will (red) or will not (far red) germinate. The same findings were made on stem elongation (far red) or short sturdy stems (red) and for leaf expansion (red) or no expansion (far red) and for many other growth phenomena.

All this suggested that red light caused a change in some master reaction which resulted in seed germination, stem growth, control of leaf expansion, and so on, and that far red light caused a reverse change in the same master reaction. The master reaction, because of the speed with which it could be moved in one or the other direction, was likely to be a change in a pigment and, indeed, through the efforts of a dedicated group of U.S.D.A. scientists at the Plant Industry Station in Beltsville, Maryland, the pigment, now called phytochrome, was isolated and chemically characterized. We can now write a simple formula to account for these findings:

$$\text{Phytochrome}_1 \underset{\text{Far red light}}{\overset{\text{Red light}}{\rightleftarrows}} \text{Phytochrome}_2$$

When red light causes the pigment to shift to the phytochrome$_2$ form, the changes resulting in seed germination, etc., are put into motion. If they are not stopped within a very few hours by far red light, they will go on to completion; but if the pigment is shifted back to phytochrome$_1$ before the changes are well under way, the whole process is stopped.

When growing plants under artificial light, it is useful to have plants of a good green color, with well-expanded leaves, sturdy stems, and a certain amount of hardness in the stems. At the same time, the plants must not be so short that the internodes are compressed with leaves almost next to one another. Therefore, we need some kind of balance between the amount of red light and the amount of far red light. Just where that balance should be for any particular plant is still a subject for some good horticultural plant physiology, because most of our present ideas on this red- far red balance are likely to be only partially right, and many of them are certainly wrong.

Now let's look again at the spectral energy curves in Figure 5 for the different kinds of lights available for artificial lighting of plants. Note first that the red- far red ratio of sunlight is fairly close to 1:1. With a 1:1 ratio of red and far red on the plants, we tend to get the type of plant growth which we call normal. Whether this is desirable will depend on what is wanted in the plants being grown. It might be interesting to have plants with somewhat shorter or longer stems or bigger leaves or even somewhat more succulence. Only future research will determine how effectively the red- far red ratio can be manipulated.

Although it tends to disrupt what is a very pretty story, the picture is not quite so simple. Recent research in Germany has shown that to some extent blue light at much higher intensities can somehow substitute for part of the red light. Sunlight is comparatively low in blue relative to red light, and so are incandescent lights. However, Cool White fluorescent lamps and the Gro-Lux lamps are relatively high in blue which tends to make up for their relative lack of red. Yet both types of fluorescent lamps are very low in the far red, which we have seen is required to maintain a growth balance. This is one of the primary reasons that plants grown under otherwise adequate levels of fluorescent lighting tend to be somewhat short and stubby; they receive too much red relative to far red light. Another difficulty with fluorescent lamps is that their red light is really not exactly at the right place for optimum efficiency in the control of the phytochrome pigment. One manufacturer is developing a lamp which has the red peak in the right place but, as far as I know, none of these lamps has an adequate level of the balancing far red light. These facts will become important when we discuss the construction of lighting systems.

Infra Red Radiation

You will note from Figure 1 that beyond the visible portion of the spectrum is the infra red region. These are the heat waves which make skiing bearable at —15° F. and play such important roles in so many of the activities of all living things. We know very little about the effects of infra red radiation on plants. We do know that excess heat must be removed and that plants have efficient mechanisms for heat removal. We also know that a certain amount of heat is necessary for proper development and have a few clues as to why. We are, however, confronted with a most perplexing problem. In the nature of the generation of light, heat is almost invariably a companion product. Since incandescent lamps generate considerable heat, much of artificial lighting has been done with fluorescent lamps which produce less heat relative to visible light. Of course heat is produced, but much of it is in the ballasts (the small black units in fluorescent fixtures). In any lighting system using fluorescent lamps, it is a good idea to have the ballasts mounted away from the unit so that the heat that they radiate will not strike the plants. This means extra costs, but the gain is worth the money.

The problem is, however, acute with incandescent lamps. They emit considerable infrared radiation which, since it travels the same path as the visible radiations, cannot fail to strike the plants. For this reason, lighting systems which use incandescent lamps tend to be hotter than those in which fluorescent lamps are used. There is more evaporation of water from the soil and from unglazed pots which, of course, keeps the soil temperature down, and there is more water loss from the leaves (transpiration) which serves the same function. For this reason, more care must be exercised in watering plants grown under incandescent lamps. The water loss can be controlled by using glazed or plastic pots, but then the soil tends to be warmer. Another method is to have an evaporating surface below the plants. Pans of water, water-saturated perlite or vermiculite or even fine gravel are frequently and correctly recommended for artificial lighting installations.

To summarize this rather diverse and difficult section, we have seen that blue, red, and far red light are necessary in small amounts in some yet unknown ratio to control the patterns of growth and development of plants. All fluorescent lamps emit radiations in the near ultraviolet which can be damaging to plants and Cool White lamps also emit high amounts of green light which is also damaging. Incandescent lamps are low in the blue and have an excessive radiation of heat.

(To be continued)

A garden is our happiest means for evoking nature's mystic, as well as nature's sensible music. It is in itself the consummate eloquence of the living silence of sunlight, a silence in which sunlight, with the aid of earth's elements, expresses itself in the lovely color of flowers.

T. Scott

A HANDFUL OF GERANIUMS

By GERTRUDE S. WISTER

Mrs. (John C.) Wister is Assistant Director of the Arthur Hoyt Scott Horticultural Foundation at Swarthmore College, Swarthmore, Pennsylvania, and author of *Hardy Garden Bulbs*.

IN THE COURSE of planting a bank with vegetation low enough to leave free the view from our house down through woods to a stream, my husband and I have found ourselves acquiring geraniums: not the tender pelargoniums which commonly go under that name, but the real ones, the cranesbills. They are represented in our part of the world by that lilac-flowered denizen of the woods which we call "wild geranium."

There are some 160 to 260 species of true geraniums (the books don't agree on the number) so our collection of twenty-six species and varieties is a modest one. Their low masses of attractive foliage, topped by bright flowers at certain seasons, mostly spring and early summer, have melted pleasantly into the hodge-podge we call our garden. They seem to have no pests, need no staking, and so far have posed no problem in maintainance. But one problem many of them do present; what are they? All have been bought in the last five years in American nurseries, so presumably their siblings exist in many gardens.

The question of identity may be summed up thus: is such-and-such a true species under a wrong name? Is it a hybrid which has appeared in cultivation, raised from seed under the name of the seed parent? If so, what are its parents? Or, in the case of a named variety, is it a seedling of a clone which should have been propagated by division?

Little has been written about the cranesbills for gardeners. The best I have found is a chapter in *My Garden in Summer* by E. A. Bowles. The Royal Horticultural Society *Dictionary of Gardening* and *Hortus II* are helpful, and there is some mention in the writings of Correvon and Farrer. All in all, the total is skimpy. But perhaps our own observation with whatever information is available will solve some of the perplexities.

When I started checking our geraniums against reliable descriptions, I became intrigued by the intricacies of their foliage. All of ours have palmately lobed leaves, but there are also species with leaves pinnately lobed. The leaves are variously scalloped, toothed, and dissected; and many can be said to be frilled, for when they are flattened out, the lobes overlap. We keep a card catalogue of our plants, and I have embellished the backs of the geranium cards with leaf prints, made with the aid of a large inking pad. The beautiful leaf designs with their exquisite veining are a joy to examine, and easier to compare with each other in the stark black and white.

The five-petaled flowers of the geraniums are borne in pairs or in clusters and resemble those of our native cranesbill, though some open less widely. There are some double forms. Colors range from white to pinks and red-purples through violets to violet-blues, often with darker or contrasting veins. There is never a great show of bloom at one time, but enough to give a pretty effect.

Many geraniums send forth flowering shoots with leaves smaller and less intricately cut than the basal leaves. Hoping for rooting at the nodes I have pinned down some of the lax ones—without success. The plants are apt to send up new basal growth in late summer, and this often stays green or reddish all winter. Most kinds are attractive all through summer and autumn.

But now let me enumerate those kinds which give me the most pleasure. A name with double quotes indicates uncertain identity.

Geranium cinereum subcaulescens. A clump, about six inches high, of grayish leaves which are a generous inch across. The flowers are carmine, and bright, bright! I like it, for the anthers are black, which gives it unusual zip. *G. cinereum* itself lacks that zip. The flowers tend to a rosy magenta, veined darker. But the plant itself is attractive.

G. dalmaticum. A clumpy, neat, little thing, about four inches high, with leaves short of an inch in width; these redden in fall. The small, bright pink flowers look to me as if they were trying to be pelargoniums.

G. endressii 'Wargrave Pink'. The basal leaves, five-lobed, are about three inches across, and the flowers, of a delicious pink, are borne on lax sprays about a foot long. *G. endressi* itself is of a pink only slightly less pleasing.

G. grandiflorum. The three-inch leaves make the loveliest print of all, lacy and delicately veined. The showy flowers are blue veined with red, the anthers and pistil dark. The plant is upright, to a foot or more.

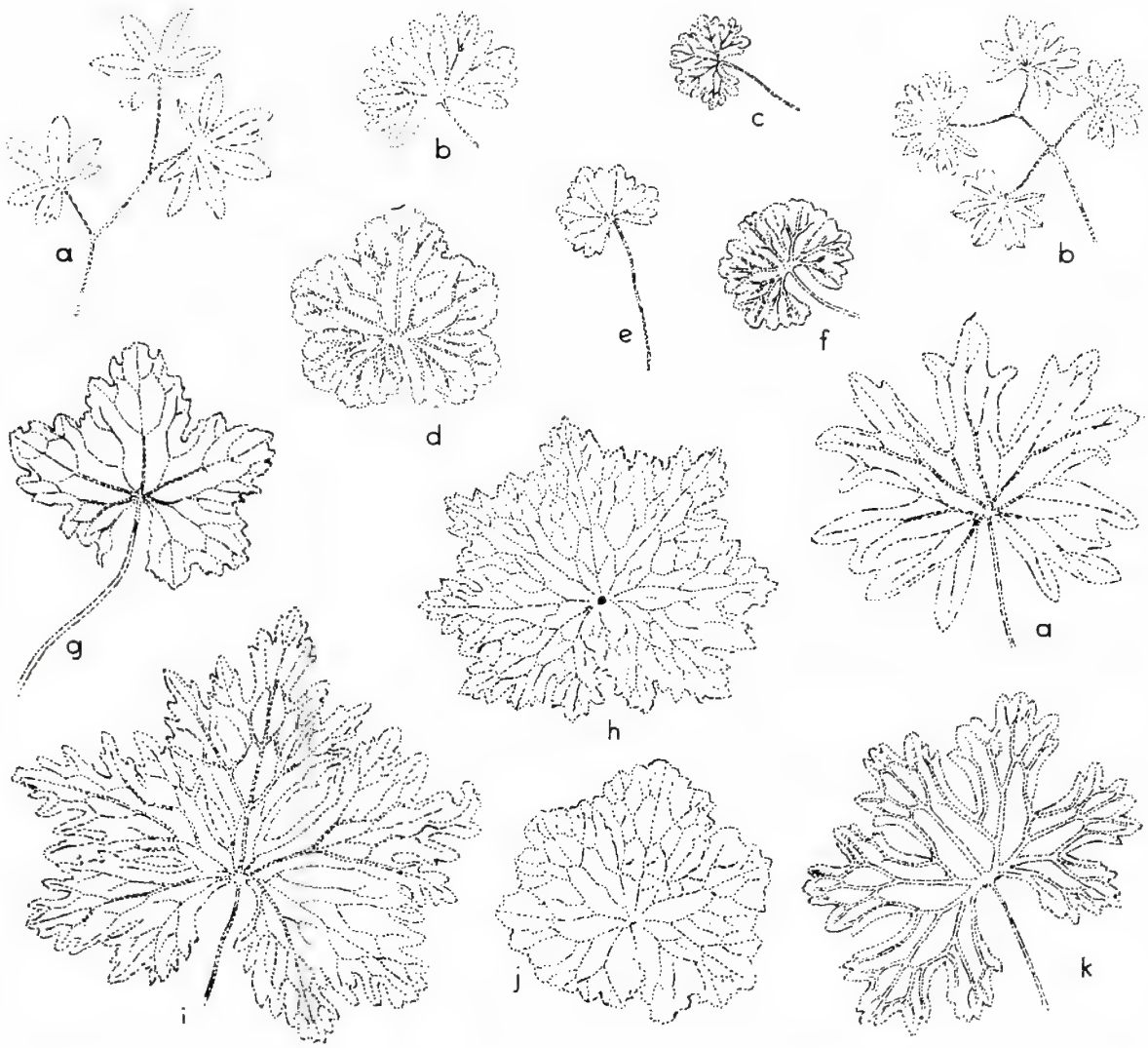
G. ibericum. Our plants look in leaf and flower very like *G. grandiflorum* but maybe a little better. The blue flowers are in showy clusters. This species is supposed to be tufted, with woolly gray leaves. We have ordered more from another nursery which mentions the gray leaves in its catalogue.

G. nivale. This is a dear, tiny plant, with leaves a mere three-quarters of an inch wide, and small, white flowers rising a little above them.

G. "nepale." We bought it under that name, and it does not fit the description of *G. nepalense*. It looks rather like *G. pratense*. Its leaves are similar, but cut nearly to the base, and the largest of our geraniums, over four inches wide. The growth is upright, the flowers a good blue-violet. The foliage might be that of *G. nepalense,* but the flowers would have to be smaller and rose-purple to fit the description of that species.

G. pratense 'Johnson's Variety'. Bluer than the type, and I like it for that. The lavender-blue flowers of our plants of *G. pratense* aren't very exciting. According to Bowles, it is prone to much variation; good color forms are worth looking for. Will ours seed themselves? The

a. *Geranium sanguineum album.*
b. *G. sanquineum lancastriense.*
c. *G. nivale.*
d. *G. renardii.*
e. *G. dalmaticum.*
f. *G. cinereum. subcaulescens.*
g. *G. endressi.*
h. *G. grandiflorum.*
i. *G. "nepale."*
j. *G. ibericum.*
k. *G. pratense.*



growth is upright; the plants good enough for unimportant positions in some shade.

G. renardii. New this past spring, and I am afraid the plants are in a place too rich and shady. I must move them to the sunnier, poorer site recommended to develop the velvet of the leaves, which are apparently its chief charm. They are just under two inches, with five lobes and a stippled surface. The flowers, said to be white with violet veins, are not supposed to be outstanding.

G. sanguineum album. The foliage gives a somewhat starry effect, especially the flowering shoots, which reach eighteen inches in length and tend to be prostrate. This habit and the white flowers make the plant useful as a companion for lilies. We grow the type, too, but I am not drawn to the color of the flowers. They are said to vary from crimson to blood red; I call ours a crimson-purple.

G. sanguineum lancastriense. A precious plant, compact and low, its leaves making quite a different print from the type, and smaller. The flowers, pale pink, veined deeper, are produced over a long season. Bowles says it comes true from seed, but I assume it would not do this grown in company with its close kin.

G. wallichianum. This sprawly plant blooms in summer, until as late as Labor Day. I like it for the late purple flowers and the long, dark green, leafy sprays which grow out in the early summer to cover the places left vacant by ripening bulb foliage.

We have a plant under the name of *G. wallichianum* 'Buxton's Blue', but it is not true. It has pleasant blue-violet flowers in May and makes a different leaf print from that of the species. Having seen the real 'Buxton's Blue' in September in the gardens of the Royal Horticultural Society at Wisley, I have a hankering for it. It is a fine violet-blue with a white eye.

G. "webbii." This looks like a larger *G. sanguineum,* with leaves four inches across. It grows into a handsome mass of trailing foliage during the summer, making a fine cover over small bulbs. The wine-colored flowers appear all summer long. There is a *G. webbianum,* a small plant, with dark-veined, white flowers. So we have another mystery.

Since it is not one of my favorites, I write of something labeled *G. "japonicum"* at the tail-end. It does, however, have intriguing features. The plants are vigorous, the foliage quite evergreen. Basal and shoot leaves are uniform in shape, very soft in the hand, and unpleasantly pungent. The flowers are bright rose-pink, not opening out wide, and the stamens and pistil extend beyond the petals. It does not fit the description of *G.*

(Continued on page 152)

HIBISCUS—"A GAMBLER'S PARADISE"

By C. S. KENNEDY

Mr. Kennedy, a retired teacher of Columbus, Ohio, has been growing hibiscus for over twenty-five years; in the past fifteen years he has concentrated on the development of new strains. Some of his plants, for experimental purposes, have been growing in the Brooklyn Botanic Garden, The New York Botanical Garden, and the United States National Arboretum. Donald R. Egolf, geneticist at the last institution, is especially interested in the development of the yellow-flowered hibiscus. Mr. Kennedy has contributed articles on hibiscus to *The American Horticultural Magazine* and other publications.

FEW VOCATIONS or avocations bring such enjoyment as those which involve some phase of creative effort, and the greater the departure from routine procedures, the more intensely satisfying becomes the contribution. Solving the problems as they may occur is a gratifying experience, but it is more than that — it is really a "Gambler's Paradise." We risk a little to gain more, and what gain could be greater than the development of a new flower or vegetable.

Can this be done? you ask. The answer — it is being done. You find the evidence in the seed and nursery catalogs which every year list new originations.

Can you do it? The chances are that you can, but the road may be long and the roadblocks many. Your worst roadblocks may be the back-breaking task of pulling weeds and the 5,000-to-1 odds, for you will have to grow thousands of plants to get the one you originally hoped for and planned for. Here is where the gambler's instinct comes to your aid, for you are pitting your time, your brains, your skill, and your durable back against tremendous odds.

The hibiscus, like the dahlia, does not come true from seed. This variability at first works favorably for the hybridizer by providing him with many possibiilties in new forms and colors. But once a desired result has been achieved, it lays upon him the necessity of three or four more years of growing to stabilize his new creation.

The *Hibiscus* is a genus in the Mallow Family; familiar members of this plant family are the hollyhock *(Althaea rosea),* shrub-althaea or rose-of-Sharon *(Hibiscus syriacus),* the rose-of-China *(H. rosa-sinensis),* and the common rose mallow *(H. moscheutos).* I have chosen to work with the hardy, northern herbaceous hibiscus, which are currently cataloged in white, pink, and red. With *H. moscheutos* I have hybridized several other strains, and principally *H. militaris,* which in 1955 favored me with a true sport.

The time table for a new hibiscus runs from six to eight years. Suppose you start with twenty thousand seeds. Under chemical treatment, you will probably lose three-fourths of them before germination. (I've sometimes lost up to ninety-five per cent!) Ten to twenty per cent of the seedlings will bloom the first year; the second year may see up to ninety per cent in bloom. During the second year you will eliminate, as they bloom, those which you decide are not worth keeping, or about eighty per cent. During the third year you will decide that you want to keep five per cent of the plants, and perhaps another ten per cent for further testing.

You ask: will these plants stabilize as to color, form, and size; will they continue to improve; or will they revert to something less desirable? Only time will tell—and time, in this instance, usually is another three years. If in these years, the plants hold true, you may be reasonably certain that you have a worthy new creation.

My originations have been induced chemically with digitalin, gibberellic acid, and colchicine, and I find the last the most effective of the three. In its action on the reproductive cells, the chromosomes, it induces a longitudinal splitting and not a transverse separation as naturally occurs. This permits the genes, which carry the characteristic traits of the plant, to double or redouble and so improve the dominant traits. Once started on the upward course, the enlarged, dominant cells may continue and increase their dominance through several generations.

These chemicals can, however, also deform, degenerate, or kill the cell or its reproductive progeny. For this reason, in working with chochicine, one should avoid direct contact of the drug with any part of the body.

By this process—with variations in method and a number of disappointments—I have been favored with pleasant surprises, some enigmas, and a few insoluble mysteries. The satisfactory progeny I have designated as "Ohio Hybrids." (Application has been made for U. S. registration.)

Colors have departed from the old pink and red and are now dispersed into three color patterns: the concentric circles, the radial rays from a central eye, and the accent type in which the color spreads in random artistic forms, most of them blending in shades or contrasting with basic color tones. Frequently, several color tones may be blended in the same flower; again, the accents may be beautifully overlaid on a white background.

In 1962 an interesting variation appeared, which I have chosen to call "silvertone." The basic color is a light silver blend, overlaid with a darker color pattern of radial form. This interesting composition usually appears on the upper side of the petal but in a few instances the under side has been silver-toned. The overlay occurs in several colors and in varying intensity. In some flowers the reverse coloring of the petals rivals that of the face of the flower.

Strongly dominant color traits existing in the genes have been heightened in brilliance by pairing of the chromosomes to form diploid or tetraploid types. The resulting colors carry brilliance far beyond that inherent

'Lavender Queen'.

'Crown Jewel'.

'Rose Chalice'.

in the older types: For example, Origination #207, 'Lavender Queen', carries around the scarlet eye a circular halo of luminescent carnation-pink. (I have not been able to capture this in a photograph, the luminescence being so intense that it affects the negative as a flash of light and is printed as a yellow flare.) Some luminescence, diffused in the petals, sparkles like minute flecks of gold.

The following color tones were measured by the Wilson Color Chart, the only chart that adequately represents the variable colors in "Ohio Hybrids."

Colors in purple from Roseine (Wilson) 629 through Mallow W-630, Phlox W-632, Tyrian W-727, Fuchsia W-28, Cyclamen W-30, Dianthus W-730, Imperial W-33, to Dahlia W-931.

In so-called lavenders the range carries from Pastel W-440 through Mauvette W-537, Mauve W-633 to Wistaria Blue W-640.

The reds carry from a near Vermillion W-18 through Rose Opal W-022, Scarlet W-19, Signal Red W-719, Turkey Red W-721, Tyrian Rose W-24, China Rose W-024, Cherry W-722, Rose Bengal W-25, Spiraea W-025, Ruby W-827 to Indian Lake W-826.

The pinks range from Rose Pink W-427 through Amaranth Rose W-530, Rhodamine W-527, Spinel W-0625, Neyron Rose W-623, Phlox Pink W-625, Fuchsine W-627 to Magenta W-27.

I am approximating an orange color but have not yet achieved a true color tone. There are now growing in my gardens several yellows which, to the best of my knowledge, are the first yellows in hardy, northern herbaceous hibiscus. These, in their seventh year of development, range from Mimosa W-602 through Barium W-503, Sulphur W-1, Canary W-2 to Amber W-505.

The only approach to green appears in the eye of one of my miniatures, #150, 'Fairy Bell'. It is a decided chartreuse.

Paralleling the significant advance in colors and color patterns has been the advance in the form of the flower. A lifting flare to the petals was followed a few years later by fluting, and more recently by scalloped and deckled edges, each adding to the inherent, intrinsic detail of beauty.

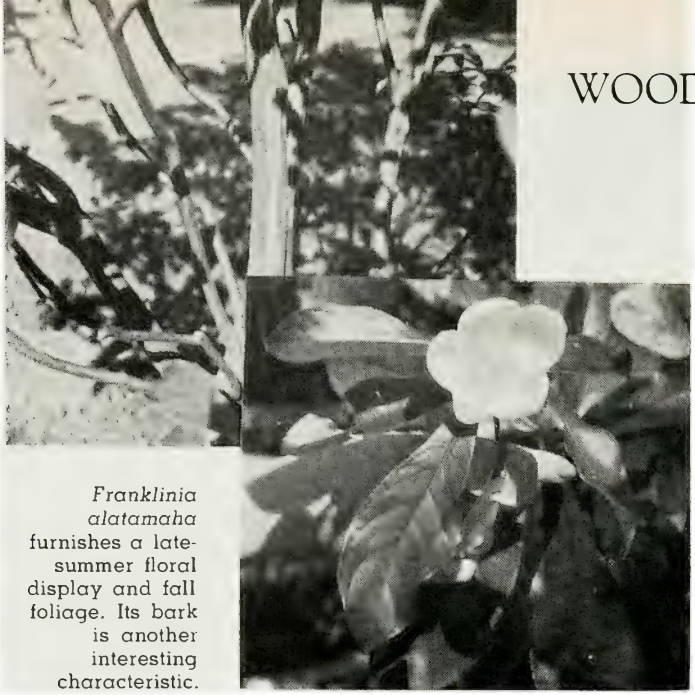
Among the most satisfying of the major changes in form are the shallow bowl, one to two inches deep, with fluting radiating outward from the eye and at the petals' edge deckled and incurved. This characterizes the "Chalice Strain" in several colors and in each of the three color patterns. On the average, the flower measures six to ten inches in diameter, slightly smaller than most of the other strains. However, I do have a miniature Chalice #282, 'Jewel Box', which is two and a half to three inches in diameter and has a scarlet eye and white halo with roseine-pink on the outer two-thirds of the petals.

Some six years ago an interesting sport crossed my path. The petals were fused into a trumpet-shaped bloom, varying four to seven inches in length and three to five inches in diameter at the edge of the lips. I have so far been unable to stabilize the form and have lost all but three of more than two hundred plants. Mystery, indeed, and of a high order. Tulip-shaped, star-shaped, compound forms with up to thirty-four petals (five are normal), many doubles, but all sports; and since the hibiscus dies to the ground in winter, it is almost impossible to propagate from cuttings after blooming, and few seeds are fertile.

Costs in hybridizing and developing new strains and varieties of hibiscus depend, of course, on the number

(Continued on page 135)

'Jewel Box'.



Franklinia alatamaha furnishes a late-summer floral display and fall foliage. Its bark is another interesting characteristic.

WOODY PLANTS OF SUMMER INTEREST

By CLARENCE E. LEWIS

Dr. Lewis, who is Professor of Horticulture at Michigan State University, East Lansing, is presently enjoying a Sabbatical leave abroad. He is especially interested in and well informed on trees and shrubs and is a frequent contributor to horticultural and other publications.

WHAT SHRUBS AND TREES should be remembered as one thinks back to other summers? The answer is, of course, those plants which provide attractive flowers, fruits, foliage, and barks during a portion or possibly a major part of June, July, August, and September. The list could be quite extensive, so some of my recommendations will not follow the general pattern but offer possibilities other than such favorites as rose-of-Sharon and the common butterfly-bush.

Beginning about mid-June the Korean stewartia *(Stewartia koreana)* and the Japanese stewartia *(S. pseudocamellia)* produce white flowers with orange-yellow centers for about a month, but this is not the most attractive characteristic of these shrublike trees. The bark becomes really eye-catching as it flakes off to give mottled hues of bronze, tan, gray, and white. When the plants are multiple-stemmed, then the bark is even more alluring, and the eye of a passerby will be engaged and return to be sure that his first impression was right. The twisted and curved stems, arising from the ground, also add to the value of stewartias in the landscape.

The larger branches of Persian parrotia *(Parrotia persica)* also display a mosaic pattern of gray to cream to tan. This lesser-known, large shrub or small tree is sturdy, upright-branched, extremely clean-looking, and fifteen to twenty feet in height, sometimes more. The inconspicuous March-to-April flowers of this member of the Witch-hazel Family are of little landscape value.

The display of creamy white (mature, to pink) bracts of Kousa or Japanese dogwood *(Cornus kousa)* and its Chinese counterpart *(C. kousa chinensis)* of June are truly attractive, but so are the basal branches which have many color variations in green to tan to light gray.

A careful pruning job should be done on these plants which possess such fascinating barks so that this feature, which is a part of them 365 days of the year, can be accentuated.

I cannot omit the birches when considering bark as the center of interest. Two birches which do not receive the attention they deserve are the river or black birch *(Betula nigra),* whose ragged bark is tan, gold, white, and brown, and the Chinese brown bark birch *(Betula albosinensis septentrionalis).* The bark of the latter seems to be of a different hue each time I see it. The color in its common name does not praise this tree enough, because the bark will have tones of copper, purplish tan, white, and reddish brown, and sheaths of it in motion from a breeze claim notice.

Many maples have barks worth noting. The striped barks of *Acer capillipes, A. davidii,* and *A. pensylvanicum* head the list. The rich copper to orange-red-brown bark of the paperback or cherry bark maple *(A. griseum)* is magnificent, as it curls and peels away from stems and trunk. This small tree, when grown with

Left. *Parrotia persica* has a mosaic pattern of gray to cream to tan on its larger branches.
Center. The copper to orange-red-brown bark of *Acer griseum* curls and peels.
Right. The basal branches of *Cornus kousa* show pleasing color variations.

Left. The foliage of *Cornus alba variegata* is of more than passing interest. Right. *Sophora japonica* offers large panicles of pealike flowers to the summer garden.

Lower right. The yellow flowers of *Koelreuteria paniculata* add to the summer landscape; its compound leaves are another fine feature.

multiple stems, emphasizes its importance to the home or garden in an exciting but aesthetic way.

Bark whether it peels, curls, or plates off places a claim on landscape interest. There are many trees which are appealing because of this, including Serrula cherry, London plane-tree, the native sycamore, and such narrow-leaved evergreens as lace bark pine *(Pinus bungeana),* Scotch pine *(P. sylvestris),* and Japanese red pine *(P. densiflora).*

Shrubs, too, show stems which bid for more than a passing glance; among them coral dogwood *(Cornus alba sibirica)* and the yellow-stem dogwood (*C. stolonifera* 'Flaviramea') are included. But there are others which are really unusual. I include in this category the 'Red Wing' rose (*Rosa pteracantha* 'Red Wing') whose winged, broad spines are a most colorful orange-red—and there are many bristly spines to remind one of this. Its loose, spreading habit suggests that this rose be used as an espalier or tied to a fence as are rambler roses.

Among shrubs which put on quite a flowering display are the St. John's-worts—some begin to bloom from mid to late July and continue to produce their yellow flowers until the first severe frost in the fall. One to which I am partial is the Henry St. John's-wort (*Hypericum patulum* 'Henry'); which has a low, spreading form and beautiful, clean blue-green leaves coming from arching, bronze-colored stems. The flowers are about two inches across and of a good yellow which combines most favorably with the foliage. It is "top tender," and winter takes its toll, but the plant starts with renewed vigor the next spring after the dead branches have been removed.

The glossy abelia *(A. grandiflora)* with its semievergreen nature near New York City and evergreen character in the South produces tubular, light pink flowers during the same period as the Henry St. John's-wort. This, too, is somewhat tender in the North.

A shrub for drier soil areas, and too often ignored, is the New Jersey tea *(Ceanothus americanus)* with its low, broad, rounded form. The abundance of white flower

clusters for about three weeks in late June and mid July justifiably recommends it.

Another July-flowering shrub is the vigorous and coarse-textured bottle-brush buckeye *(Aesculus parviflora),* whose white flowers last from two to three weeks. The flower clusters are long and resemble the shape of a bottle-brush. This plant is not for the small home grounds, because it will spread to ten feet, though it grows no higher than six or seven feet.

The summer-sweets with their fragrant, white flowers in late July and early August are found along stream and pond areas. The one species that really puts on a display is the taller and more vigorous form, the tree or Japanese clethra *(C. barbinervis)* which may extend itself to a height of ten and possibly twenty feet. The leaves are a clean green which, when coupled with the pure white, pendulous racemes makes it one of the most beautiful of large shrubs or small trees. The bark, too, is attractive, the larger branches being of a cinnamon color.

A small- to medium-sized tree with flowers resembling those of the Japanese clethra is the native sourwood or sorrel tree *(Oxydendrum arboreum).* The flowers are generally not as abundant as those of the clethra,

Upper left. The bark of *Stewartia koreana* flakes off, leaving a mottled effect.

Upper right. *Betula nigra* has a ragged bark in tones of tan, brown, gold, and white. Lower right, close-up of the bark of *B. nigra*.

Below. *Hypericum patulum* 'Henryi' puts on a flowering display from July till frost.

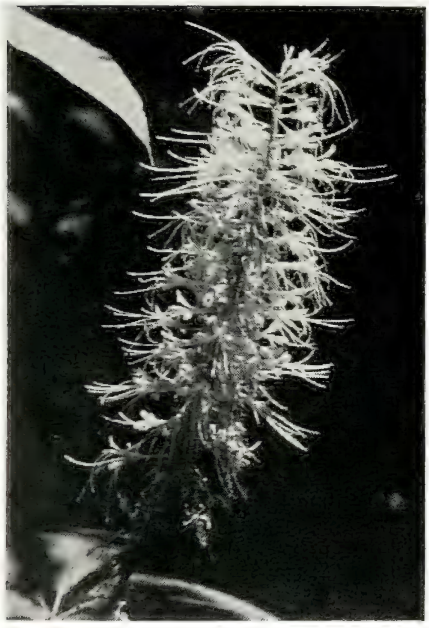
but there is a greater tendency for this plant to grow with a single main stem. If you have never seen the sourwood with its brilliant red fall foliage, then you have missed one of the real treats of the plant world.

Summer flowering should never be mentioned without including the golden rain-tree or varnish-tree *(Koelreuteria paniculata)*. Its panicles of yellow flowers begin to show in late June and hold the display until about mid-July. There are many complimentary things which could be said about the tree, and one is the unusual shape of the compound leaves. The leaflets are sometimes dissected a second time, creating an elegance which is beyond my pen to describe adequately.

The Japanese pagoda- or scholar-tree *(Sophora japonica)* also displays large clusters of flowers which begin to appear in late July and persist until mid August. The cream-colored, pealike flowers are followed by green pods which are constricted between each seed like a necklace. An improved, patented introduction is now available under the name of *Sophora japonica* 'Regent'. It develops a better head, has a better root system, grows faster, and flowers at an earlier age. This member of the Pea Family has foliage superior to that of other members in that there is a luster to the pinnately compound leaves.

The hardy silk-tree *(Albizzia julibrissin)* with its sensitive, compound leaves spread over the broad crown is fast-growing and temperamental. It is susceptible to severe cold in some northern states but recovers quickly and puts out five to ten feet of stem growth. It bears most unusual and delicate-loking flowers. Fine-textured and pinkish, they appear during mid July and continue to extend themselves over the canopy of extremely fine-textured foliage until early September. The 'Rosea' selection is rated as hardier and is generally grown in preference to the species. Even if you never have a flower on this plant, the form and fine-textured, blade-like leaflets would be sufficient reason for growing it.

The red berries of *Daphne mezereum* are a bright note in June and July.



Aesculus parviflora is a coarse-textured, vigorous, July-flowering shrub.

The Franklin tree *(Franklinia alatamaha),* first found many years ago along the Alatmaha River in Georgia, has an unusual flowering period. The large, white petals and yellow stamens first appear in late August and continue to do so until the first severe fall freeze. The long, spatula-shaped leaves furnish an excellent setting for the flowers and take on beautiful tones of orange to red to bluish red in fall. This makes the flowers even more alluring. The bark, smooth and twisted and often showing vertical dark lines, adds to an already pleasing plant.

The fruits of some shrubs and trees make their appearance during the summer, some as early as June and July. One seldom thinks of the February daphne *(Daphne mezereum)* for its fruit, but the bright red berries distributed along the stem are ornamental—and poisonous, if eaten.

The Oregon holly-grape *(Mahonia aquifolium)* has large clusters of light blue fruits tucked among its branches in late June. The fresh, bright red samara fruits of the amur maple *(Acer ginnala)* and the Tatarian maple *(Acer tatarica)* appear about the same time.

In late July a wealth of attractive and brightly colored fruits furnish a splendid display. Some of the hawthorns, such as the thicket and the Arnold with their little, bright red apples, antedate others which follow in August. The Sungari cotoneaster, the smooth and staghorn sumacs (*Rhus glabra* and *R. typhina*), the European mountain-ash, the spice-bush *(Lindera benzoin),* bayberry, many roses, crab-apples, and an array of shrubs and trees carry interest through summer and until autumn's attractions take over.

HIBISCUS—"A GAMBLER'S PARADISE (Continued from page 131)

of plants grown. I started with about ten thousand plants, but from 1958 to 1963 I averaged forty-five thousand to fifty thousand plants each year. Since 1963 the number has been reduced to thirty thousand and in the near future will be reduced to fifteen thousand or twenty thousand. In the fourteen years I have been engaged in hybridizing, total costs have exceeded $125,000. As a hobby it has been interesting and satisfying; as a business, it is doubtful if the investment will ever be recovered.

The hibiscus has the reputation of being difficult to propagate. Yet there is a method, mist spray, which with some precautionary steps is relatively simple, and, if closely followed, will produce eighty-five to ninety-five per cent rooting in cuttings taken when the plant is forming buds.

When you consider that a well-grown plant will carry from three hundred to eight hundred blooms, brilliantly colored, six to eleven inches in diameter, and at times twenty-six blooms in a given day, it is cause for wonderment that nurserymen hesitate to introduce them to their clientele.

Visitors are welcome to my gardens, and the peak of bloom is mid-August till frost. I prefer a phone call (Area Code 614, 889-8494) or letter for an appointment. Bright Road, on which I am located at No. 4338, is one mile north of Route 161 and runs from the Scioto River east one and a quarter miles to Sawmill Road, and Dublin, the town, is fifteen miles northwest of Columbus.

He who becomes impassioned of a flower, a blade of grass, a butterfly's wing, a nest, a shell, wraps his passion around a small thing that always contains a great truth. Maeterlinck

THE ROLE OF MICROCLIMATE IN THE CULTURE OF TROPICAL EXOTICS

By LINCOLN ADDERLEY

Mr. Adderley is a gardener at The New York Botanical Garden.

HOW MANY OF US stop to think of the important role that environmental conditions play in the native haunts where many of our most unusual tropical plants grow. Walking into the tropical houses of some private and institutional greenhouses in this country and abroad, I have been amazed by the intolerable heat. The idea that tropical foliage plants grow in a constant Turkish bath is a misunderstanding. The fact that plants will grow at all under such conditions only proves that they can exist in spite of us.

Whenever I have an opportunity to travel to tropical or subtropical areas, and on my meanderings through the bush or forest, I try to observe closely the varying conditions under which certain plants grow. This was particularly interesting in the lowland forests of Territory Amazonas along the upper Orinoco River in Venezuela, when I was on an expedition several years ago for The New York Botanical Garden. During this trip I made a point of observing closely the role that microclimate plays in several areas in which some of the most luxurious tropical plants grow.

We are all aware of the value of evaporative cooling not only in our homes but particularly in the greenhouses during the warmer months of the year. We know that if water is sprayed over a greenhouse roof in the form of a mist on a hot day the temperature inside that house can be reduced by ten to fifteen degrees. The water or moist air—provided the air is kept in constant motion—will absorb a considerable amount of the heat, carrying it off as it evaporates. This is the reason for wet pads and exhaust fans in so many of our modern greenhouse ranges. When the temperature warrants it, the exhaust fans operate and the vents open at the opposite end of the greenhouse where air is pulled through the house. The air is sucked through a wet pad, and as this air passes through the house, it absorbs the heat and carries it off. This reduction in temperature is of considerable benefit to the plants and is the best method of growing intermediate and cool or alpine plants in this country where the summer months are so warm; otherwise, they just exhaust themselves in the warm weather. A biproduct of this cooling system is that the relative humidity can always be maintained at a high enough level during the summer months when greenhouses dry out rather rapidly.

In a way the jungles of South America are great evaporative coolers for the plants inhabiting the forest floors or the epiphytes clinging to the tree trunks or branches. In a recent article Dr. Howard Irwin, one of our botanists who has made many trips to the tropical forests of South America, made a fitting comment—"The damp coolness of the forest."

The majority of the more exciting tropical plants are inhabitants of the forest floor where they receive only filtered or indirect light. (It is this lack of light which accounts, to some extent, for the beautiful variegation and markings on the leaves of many tropical plants.) Some plants develop specialized cells or layers of cells which enable them to magnify and transport minimal light rays.

While it does become quite warm and humid in the great tropical areas of the world, we must remember that the towering trees are the natural evaporative coolers for the plants growing on the forest floor. We are all aware of the enormous amount of water a single tree transpires on a sunny day. Multiply this by many trees in any given forest and we get some idea of the amount of water vapor which is constantly hovering just above the tree tops and the resulting cooling which goes on between the tree tops and the forest floor. To this is added the cooling effect of the shade, so if the temperature in the surrounding area—say on an open river—is 90° to 100°, it could easily be 85° on the forest

Eriopsis sceptrum, an orchid from lowland in Venezuela.

Right. Close-up of the flower of *E. sceptrum*.

Above, the male flowers of *Catesetum pileatum;* right, the female flowers of *C. pileatum.* This orchid was found growing in Venezuela on dead trees in exposed areas.

floor. It is humid and damp most of the time but not uncomfortably hot. I have tramped through miles of forest on a scorching hot day and have remained comfortable unless I exerted myself. In fact, I have been baking, figuratively, in an open canoe on the river, and then, as soon as I moved into the forest, have found relief from the sun and intense heat.

I believe that the greater number of tropical plants grown under glass would do better with a day temperature of 80° to 85° and a relative humidity in the seventy per cent range. To keep the greenhouses closed and the humidity and temperature at a high point causes conditions which are harmful to the plants. Furthermore, when plants grown under such conditions are moved out of the houses to other areas for decoration or show, they suffer, since they are soft and unable to endure a change in conditions.

Even without an elaborate exhaust system, the use of fans will keep the air in a greenhouse in constant motion. If fans are operated under benches or near the ground level, they pick up moisture from the floor and under benches and circulate it among the plants. The moist air in motion will bring about fresher and cooler conditions.

Many tropical rarities respond to seasonal changes and grow only during the wet and cooler season of the year. I have found this to be true of many orchids—those which normally grow in more exposed areas—and some members of the *Amaranthaceae* and *Gesneriaceae.* Along the upper Orinoco River in Territory Amazonas many of the orchids, Amaranths, Gesneriads and, in the *Araceae,* the caladiums all commence their growth just before the rains start. Then they produce luxuriant growth and flower during the rainy season which usually runs from April well into October in this part of South America.

The nights are pleasantly cool then, and a light blanket is a handy article when one is sleeping in hammocks in the jungle. The average night temperature in this area, which is about fifty feet above sea level, is 60° F., while the day temperature is usually 85° to 90° in the open. This large temperature differential between day and night is an important factor to bear in mind when trying to cultivate these plants in greenhouse or home. If too warm a night temperature is maintained, orchids refuse to flower but continue to produce healthy plants. It is simply amazing what a drop of 5° in night temperature will do to flowering plants.

Many of the orchids, which I brought back from Venezuela, were growing in a greenhouse in which a minimum night temperature of 65° was maintained. After a few years of producing healthy plants but no flowers in some species, the plants were moved to the intermediate house with a night temperature of 60° and most of them set flower buds. One which responded particularly well to this change, although it is a lowland species, was *Eriopsis sceptrum.* It is well to keep in mind that many common house plants from this part of the world grow and flower during the heaviest part of the rainy season, which is in winter in this part of tropical South America, and that they rest during the dry season when it is quite hot.

Many of the plants in the more exposed areas, such as orchids inhabiting rocks and trees along the banks of rivers, caladiums growing in shallow leafmold on exposed rocks, and certain tuberous gesneriads in similar locations, would never be able to withstand the strong sun in future growth during the drier season. One genus

which impressed me on this expedition was the *Catasetum*. These orchids grow on dead trees in completely exposed areas. During the rainy season they grow rapidly and flower; then they lose their leaves. During the dry season the plants bask in the tropical sun, but the pseudobulbs are covered with white sheaths which not only prevent excessive drying but help to reflect light. This sheathing is composed of strong tissues and remains on the plant for several years. I believe this exposure to the strong sun during the resting or ripening period is of some significance in these plants which are polymorphic—being able to produce the female and perfect flowers. Growing in the full sun, these plants are able to make a great deal of sugar and during the rest period this sugar is further concentrated. The female flowers are fairly common on these plants in the field, but under cultivation they are rarely produced.

With a better understanding of the environmental conditions, we can solve some of the riddles which perplex us in our attempts to cultivate and flower some of the rarest and most beautiful tropical plants. We should, perhaps, think in terms of two floras—the macroflora and the microflora—in considering the vast tropical forests of the Amazon and Orinoco basins. And since most of our house plants and delicate tropical plants are a part of the microflora, we should ask ourselves where does this plant come from and exactly under what conditions does it grow. In almost every plant family we find genera and species growing under different environmental conditions. We find certain species of orchids growing in full sun, some in tree tops, some buried among the branches, others farther down the tree trunks, and some, which require shade, even growing on the north side of the lower trunks of trees. All these species have their special little niches and require slightly different light and temperature conditions. These are the points which will help us in eventually growing some very difficult plants and in growing better some of the plants already under cultivation.

A great deal can be accomplished if gardeners pay heed to the records of plants made in the field by botanists at the time of collection.

A NORTHERN BOG

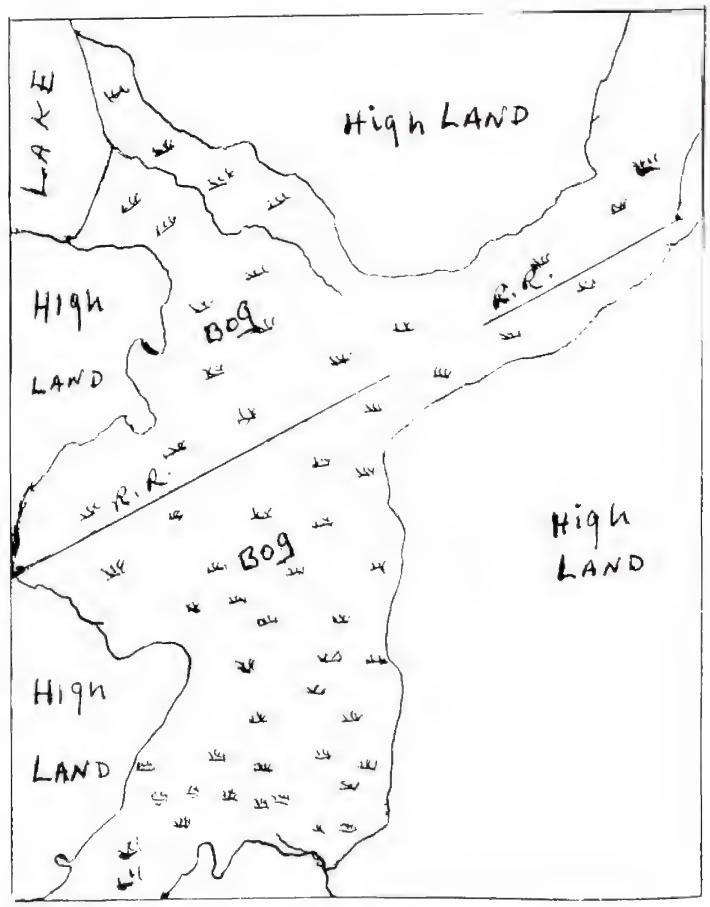
By GEORGE A. ELBERT

Mr. and Mrs. Elbert, who are enthusiastic amateur botanists, visit many interesting and less-known areas to photograph native plants about which they write and lecture.

WHEN WE MENTION some place in the country we intend visiting, we're frequently asked, "What are the activities?", meaning planned ones, of course. Though we make fun of this sort of thing, we are grateful to the incurious and timid—for what would the countryside look like, if all were suddenly let loose upon it? One of the least likely places for a crowd to gather is in a bog, and since bogs are beautiful and fascinating, we hope that some will remain relatively unmolested.

Last June Virginia and I turned into a narrow road which skirts part of a lake in northern New York. An open space in the woods permitted us to park the car opposite a well-beaten path leading up a hill. After a short, stiff climb, we emerged on a cliff overlooking the lake. There in the warm spring sun, well protected from wind, we spread our blanket, relaxed, and enjoyed the view. We were about one hundred and twenty feet above the lake, a blue sheet of water two miles long and dotted with little islands, the shore sufficiently steep, wooded, and irregular to give variety to the outline. Our pleasant picnic spot on a promontory also offered us the advantage of overlooking the bog to be explored that afternoon. A geological survey map is very helpful, but there are important features which only a bird's-eye view reveals.

The bog shore rounded out the lake at a point where a break in the higher land occurred. A white beach with a row of houses separated the two. Stretching to the



Left. *Houstonia longifolia.*

Right. *Arenaria lateriflora.*

south was a river of flat greenery which, in the distance, broadened into a low forest. Our survey permitted us to estimate the distances involved and suggested some favorable points of access. Since this was our first acquaintance with a true northern bog, as Bergen earlier had been our first acquaintance with a swamp, we had boned up on the subject of the difference between the two.

In my article on Bergen Swamp in the May-June issue of *The Garden Journal,* I quoted from Dr. Dansereau's *Biogeography* that "On the whole a swamp is a wet prairie." This piece of Gallic wit and precision is matched by his characterization that "A bog on the whole is a large cushion." Swamps are under water much of the time and support mainly reeds, rushes, and grasses. Bogs, on the other hand, are rich in blooming plants and shrubs—one reason why they crop up so often in the annals of wild flower enthusiasts.

Bogs must be born and must grow up, reaching maturity if no natural catastrophe intervenes. Their old age is manifested by the gradual disappearance of their boggy characteristics and transmutation into rich forest land.

A more factual way of presenting the history is based on a free interpretation of a series of schematic drawings in Dr. Dansereau's book. At first there is a lake with a shallow border. Rushes grow and lay down peat. Sedges arrive. They extend farther and farther into the lake, laying down sedge peat. On top of this peat sphagnum moss builds up, rapidly laying down a much thicker layer. With the surface having become relatively firm, shrubs of the Heath Family, many herbaceous plants, and finally water-loving trees take hold. The water level of the lake is raised, creating other shallow areas which, in turn, are invaded by rush, sedge, and sphagnum. Gradually the whole surface is built up into an organic soil supporting a rich hardwood forest.

The map shows how the lake must originally have filled the defile and the low ground east and south of it.

A short drive brought us close to the beach, where we were able to confirm that it was man-made and as brand-new as the unsheltered cottages which stretched along it. On the bog side the sand was protected by a bulkhead from which we looked down into a mass of reeds, sedge, small shrubs, and debris amidst moss and algae. A bit of color caught our eyes, a flower whose long sepals, deep red at the base, and even brighter small petals, tempted us to identify it as a battered bee-balm. However, a glance at the big, pinnate leaves revealed that it was a cinquefoil, *Potentilla palustris*. The purple or marsh cinquefoil is totally different in appearance from its white and yellow-flowered relatives.

Having decided that a walk in this particular section would offer little but exercise, we returned to our car and drove to a sand pit, about three quarters of the way down the defile.

We walked over the hill through a bright woods of familiar trees, with little on the ground except the remains of last year's brown leaves. The descent was gradual at the beginning, but grew somewhat steeper and seemed to plunge into the flatness of the bog. There, in contrast, it was as dark as the bottom of a well, and our feet sank in the deep bed of moss.

As our eyes became accustomed to the gloom, we proceeded straight west between the trees until we came upon debris and water. We thought it advisable to retrace part way and explore farther to the south. Within a hundred yards we found ourselves in the midst of an "al fresco terrarium." For growing out of the thick sphagnum, which coated the surface of everything as

snugly as a blanket, were hundreds of tiny orchids.

One of the enchantments of these places is the intense play of light and dark. So thick is the cover over head that the sun finds entrance only by the narrowest of interstices; and as it moves, so do the beams which come and go, illuminating one detail and then another. In the cold brilliance these microscopic and homely flowers become frosty jewels arranged in a setting of darkest jade.

The heart-leaved twayblade *(Listera cordata)* extended no more than two or three inches above the sphagnum, the threadlike stem interrupted by two opposite, heart-shaped leaves. The raceme consisted of ten to fifteen complex flowers, so extremely small as to require magnification. Under the close-up lens of our camera the petals and sepals were greenish ovals arranged evenly around the column. The lip, long and deeply cleft, was quite red. The effect was that of a fancy bow on a gift box, with five regular loops and two long ends spread and cut outward on the bevel. These details are not precisely those of the botanies; this might have been a *forma,* for all we know, until we have seen more specimens.

The small, northern bog orchid, *Habenaria obtusata,* is scarcely larger. But it has a leaf, shaped like that of the lily-of-the-valley, which rises out of the sphagnum and rather dwarfs the flower-stalk. The latter bears ten or twelve, grotesque, greenish white flowers which, seen from below, appear like long-tailed birds with two deep yellow spots of anthers for eyes. An unlovely plant but fascinating in structure as are all orchids.

While photographing we became aware that we were indeed supported by a floating mat. While I was posing the picture, my slightest motion displaced the tripod, and Virginia, in examining a plant yards distant, started an unseen wave which had the same effect. Yet the ground beneath the upper layer of sphagum seemed firm enough.

The following morning we parked the car where the road to the southern tip of the lake crosses the railroad. For a while we walked the ties eastward, noting the leaves of the pitcher-plant *(Sarracenia purpurea)* in the open bog, many clumps of the little, white *Arenaria lateriflora,* and a few coral-roots *(Corallorhiza trifida).* When we reckoned that we were about midway in the bog, we turned northward across it.

Before long we were pulling ourselves over water on piles of debris in the shade of arbor-vitae. It seemed reasonable to suppose that an earlier generation of trees had had firm footing here, an inundation of displaced lake water killing many of them. Their trunks, impervious to the effects of water rot, piled up and sufficient organic matter accumulated to start the second growth. Such sinks are common in bogs and are not usually worth exploring. It is more effective to work a short distance from the shore where the flowers are usually found.

Still this wretched area delivered one plant hitherto unknown to us. Out of the blackness there loomed strings of dancing golden balls, and soon we were examining canes of the tufted loosestrife *(Lysimachia thrysiflora).* They were about three feet high, with narrow leaves ranging along the stem. Out of each axil grew a peduncle bearing a fluffy ball of yellow spikes. When taken apart, the individual flowers were revealed as having the unusual number of six, very narrow petals.

After we had wearied of the clambering, we turned westward toward the shore and, on approaching it, pro-

The twin-flower, *Linnaea borealis;* right, a close-up of its coral-red, bell-shaped flowers.

ceeded southward. The area was more complex than that of yesterday and rather more open. Short grass had taken hold in some places, elsewhere were sheets of sphagnum. Thickets turned up and young forest trees. The bog was in process of becoming solid land. Soon we were passing from one wild garden to another with as much spectacular bloom as we could have wished for.

After the first rush of spring flowers the bogs become more selective for a time, most of the color being provided by orchids. Between the first and twentieth of June, around the fourth of July, and again in early August, appear the most remarkable of this magnificent family. For more than an hour we wandered from one group to another of the large and the small yellow lady's-slippers, the showy lady's-slipper, and late stands of the pink lady's-slipper. Tall northern green orchids *(Habenaria hyperborea)* were numerous in the wetter areas and in sphagnum were *Listera cordata* and *Habenaria obtusata* of the previous day.

Where logs were lying, we were delighted to find the twin flower *(Linnaea borealis)* tripping across them in the moss. It is only a few inches high, bearing little, round leaves on the stem from which, divided at the top, dangle two coral-red bells with lobed edges. The double rows, which rise from runners, forming patterns over the ground, are strangely sugestive of a fairy rite.

The false-lily-of-the-valley *(Maianthemum canadense)* is one of the common spring flowers, carpeting large sections of acid woods with its little leaves and, when in bloom, making quite a show with its racemes of small, white flowers. In deep sphagnum out in the sun, we found plants of maianthemum which were several times larger than any we had seen before. The leaves were a bluer green, the stem loaded with flowers large enough to be fully appreciated without magnification. Variety *interius* Fern., said the botany. There was, however, an interesting difference. In addition to the basal leaf and the one on the stem, each plant bore two narrower leaves. This graceful variety would be ideal for the garden, if it could be tamed.

The false-lily-of-the-valley, *Maianthemum canadense,* and close-up of the raceme of small, white flowers of *M. canadensis interius.*

The last discovery of this bog journey was a houstonia. We have found so many of this varied genus that another one seemed improbable. But there it was, *Houstonia longifolia,* and looking pretty much like some of its relatives.

To the "buffs" what we had been engaged in these two days goes by the name of bog-trotting. We certainly did not trot. Progress is slow, and there is much to see and many impressions to absorb. It is the unfamiliarity of the environment which deters people from exploring bogs. Incidents of quicksands and snakes are part of the folklore. In reality there is little to fear. By keeping to the shore it is possible to hike in perfect safety, and the reward will be one of the most interesting and spectacular of nature's exhibits.

It is a time when meadows are composed
In dreaming gardens of dim pearl, opaque rose,
bright gold, and violet—
Goldenrod, Joe Pye, ironweed and bonset,
Their curled cymes and panicles pierced
by the slender spears
Of water reeds,
Where a brook creeps stealthily, unseen, and meets,
Breathing a scent of mint—
Enchanted gardens that linger week on week
Unchanging and at peace.

It is a pause of the year,
Of landscapes painted and still,
Voiceless but for the low syncopation of insects
Plucking their one dry string;
A gracious caesura balancing
The spoken and the unspoken syllables of time,
No bird sings now to break the grave suspense
With an unseasonable eloquence.

C. Shanafelt

THE TIARE APETAHI OF RAIATEA

By E. CREUTZ

Dr. Creutz is Vice President for Research and Development at the General Atomic Division of General Dynamics Corporation, John Jay Hopkins Laboratory for Pure and Applied Science, San Diego, California.

THE TAHITIANS and, in fact, the natives of all the islands of French Polynesia are very fond of flowers. Men, women, and children wear them almost continuously, and the typical picture of a fine-looking Polynesian displaying flowers in the hair or over the ear is indeed an accurate one.

The flower most frequently associated with the Tahitians is the tiare tahiti, *Gardenia tahitiensis*. This is abundant on Tahiti and is worn singly or in groups, or is woven into massive leis and floral crowns.

There is another much less common, but highly appreciated flower which on a casual glance somewhat resembles the tiare tahiti, being an equally brilliant white and of similar heavy texture and ruggedness. This is the tiare apetahi which, according to the Polynesians, grows only at one locality on the Temehani Plateau on the Island of Raiatea, one hundred miles northwest of Tahiti itself. And in classification, rarity, and symbolism, it is quite different from all other flowers in Polynesia.

I learned much about the tiare apetahi from Sonny (John) Chave, Tahitian manager of the Bali Hai Hotel in Uturoa, Raiatea. Sonny is as Tahitian as one can be and is recognized as an authority on the Tahitian language and lore. Many modern stories have turned up about the tiare apetahi, but Sonny assures me that the true legend is the following. As do so many things in French Polynesia, it concerns itself mainly with love.

A young vahine had great love for a strong and handsome tane, whose call for adventure was such that he deserted her and sailed from Raiatea in the direction of Bora Bora. As she waited through the months and he did not return, she despaired with loneliness and all desire to continue living departed from her. She ascended Temehani Mountain for a final searching look

The tiare apétahi, *Apetahi raiateensis*.

over the beautiful lagoon to the north, to the neighboring island of Tahaa, and in the far distance towards Bora Bora where her lover had gone. Alone on the summit she waited for death to come and comfort her. During the night she felt a cold breeze passing over Temehani, and she knew that death was growing imminent with each next more feeble beat of her heart. But just before sunrise, her will to live suddenly returned; she tried to bring back her departing soul to rejoin her body and to resist the overpowering force of death. Fervently, she reached her arms to the skies, cold white fingers outstretched, to recall the fleeting breath of life, and as she did so, she uttered a deep sigh. But she was too late; her soul had vanished in the direction of Bora Bora, following the route of her lover's canoe, and she perished.

Sonny explained that each tiare flower is symbolic of the girl's outstretched hand and the five-pointed petals are, of course, the five ghostly feminine fingers. The tiare plant is the reincarnated girl, and each morning just before sunrise the white flowers open with an audible sigh, which is the vahine's last breath in her vain attempt to recall her soul. Therefore it is easy to understand why the tiare will grow no place else in the world except on Temehani Plateau.

Sonny also explains that the true Tahitian name is

Temehani Mountain beyond the prominent volcanic neck, Orotano, seen from the Bali Hai Hotel in Uturoa, Raiatea.

not tiare apetahi, as it is written in the books, but is iare paetahi. Paé is the Tahitian word for five, and tahi neans sides. Thus, the flower with five sides. Accordng to Sonny, few Tahitians correctly speak the real anguage today. Many changes occurred when the Chiiese traders came in large numbers during the latter part of the last century. Having difficulty with some of the Tahitian pronunciation, they unconsciously initiated certain changes and for them, apé was easier to say than paé. The word apétahi by itself means to wink or flirt and, considering the emotional state of the young vahine in the cold Temehani dawn, this hardly seems to express the appropriate mood.

The tiare apétahi is a member of the *Lobeliaceae* or Lobelia Family of the Order Campanulales. I have known long and well its relative in the United States, the scarlet lobelia or cardinal-flower, *Lobelia cardinalis,* and indeed the forms of the two flowers are rather similar. But unlike the cardinal-flower, the tiare apétahi is a brittle shrub, two to five feet high. Its scaly black bark is marbled with patches of dark gray. In terminal clusters on many of the branches there are thirty to forty leaves, dark green above and pale green below. These are oblanceolate, acuminate, and attenuate at the base; 7 to 14 cm. long and 1½ to 3 cm. wide; and serrate in the upper half, with teeth 2 to 4 mm. long. The odorless flowers are among the leaf clusters on pedicels about 1 cm. long, each with a pair of linear bracts at the summit. The ovary is about 12 mm. long, crowned with five slightly longer, linear calyx segments. The corolla is 8 to 10 cm. long, white within and light green without, and is a slender tube slit on the one side towards the apex and below and divided at the apex into five oblanceolate lobes, spreading like the fingers of a hand or the blades of a partly opened fan.

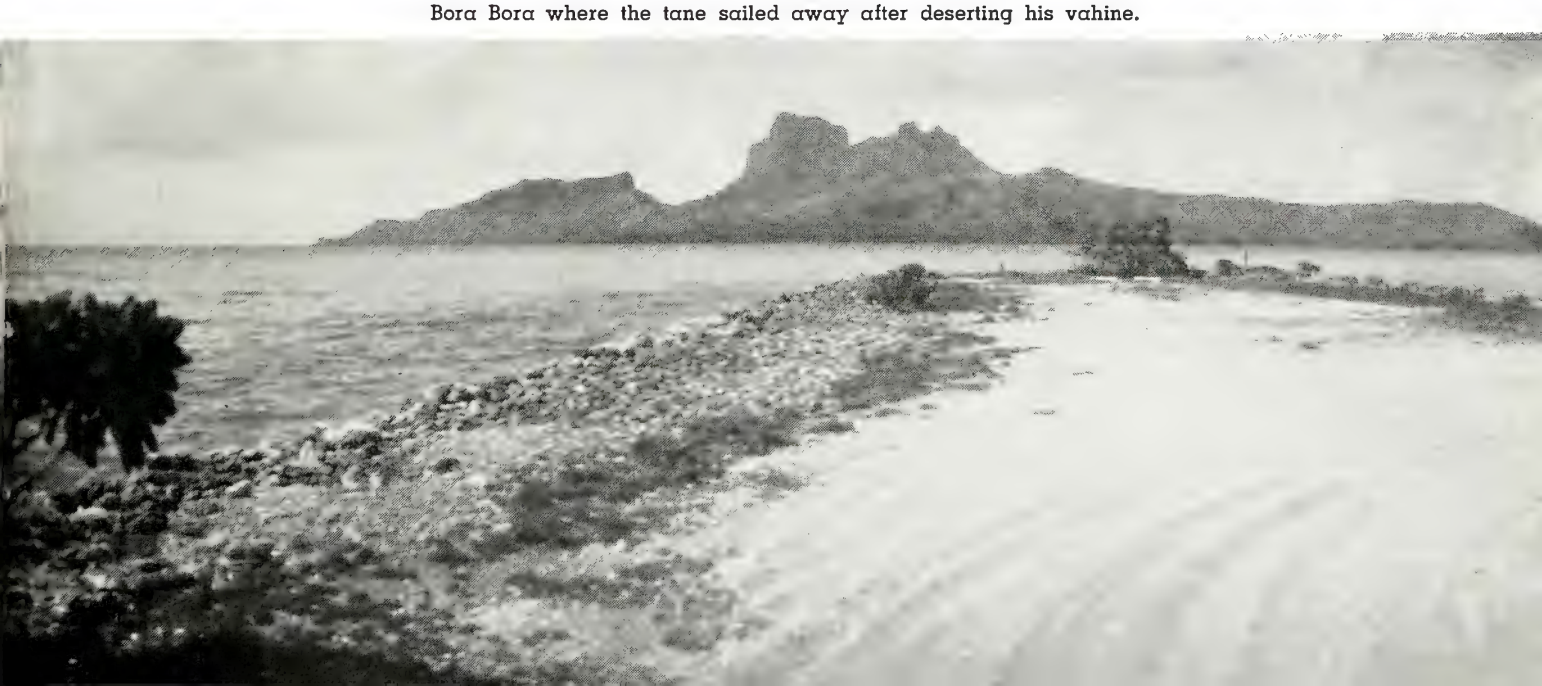
The hike to find the flowers on the Temehani Plateau is a stimulating and interesting one; however, not one recommended without a native guide. Ours was Ehu (Jimmy), a fourteen-year-old Polynesian who climbed the slippery rocks in his bare feet with much more skill than we in rubber-soled shoes. We started our journey to the plateau by a three-mile jeep ride over an extremely primitive road, followed by a six-mile walk over

Apetahi raiateensis
From Temehani Plateau, Raiatea,
August 28, 1964.

little or no trail at all. The plateau is landward from a large volcanic neck, called Orotano, just south of the village of Uturoa. This neck is a distinctive feature on the west side of the island. Going inland we crossed three broad valleys hidden from the coast by the neck, punctuated with streams, rock hills, and waterfalls, with inviting pools and rapids for a rest and a cool bath. Finally we reached the plateau itself, which is a somewhat level area about twenty-three hundred feet above sea level, forming the central spine of Raiatea. From the plateau we gained a broad sweeping view of the lagoon, the smaller island of Tahaa, and the expanse of ocean to the north and to the east. There is an almost continuous wind on the plateau and frequent showers of rain.

The tiare shrubs are distributed over several acres,

Bora Bora where the tane sailed away after deserting his vahine.



Vahinetua (Lillian) Raioho, young girl of Boro Bora, and friends.

Tahitian vahine wearing tiare tahiti.
(Permission from Universal Color Slide Company)

separted from each other by an average distance of about ten meters. There is grassy turf between them, and the pandanus tree is common in the more moist patches in the same area. Small streams with deep-cut banks wander across the plateau to tumble down the sides in noisy waterfalls.

The photograph (p. 144) shows one of the terminal leaf clusters of the tiare apetahi, including a single flower, and also a separated flower showing the fan-shaped and tubular corolla.

I have deposited specimens of *Apetahi raiateensis* in the Bernice Pauahi Bishop Museum in Honolulu and in the San Diego Natural History Museum.

It is a pleasure to thank Dr. Reid Moran of the San Diego Natural History Museum for his help in preparing the botanical description given above; Mary Barton Powers for the hospitality of the Bali Hai and for providing a link with Sonny; and specially to thank Sonny for providing a link with the delightful Polynesian past and present.

Orotano Peak overlooking the Raiatean village of Uturoa. The background is Temehani Plateau, home of the tiare apétahi.

FROM THE PLANT KINGDOM ~ NEW THERAPEUTIC AGENTS

By NELSON COON

Mr. Coon has enjoyed a long and interesting career in horticulture, starting his own florist business in Rhinebeck, New York, in his second year in high school. After service with the Air Force in World War I, he added a nursery to his expanding operations which included the wholesale trade in Parma violets in a range of nineteen greenhouses. In the midst of the depression of the 1930's, he accepted the position of Superintendent of Maintenance of the thirty acres of landscaped grounds and gardens at the Perkins School for the Blind in Watertown, Massachusetts. During the last fourteen of the twenty-nine years Mr. Coon spent at the Perkins School, he was Librarian of the circulating library and of research.

Now enjoying retirement on Martha's Vineyard, he continues to write books—he is the author of seven—and to contribute to many horticultural publications.

IN THE COURSE OF corresponding recently about a list of simple, mostly old-fashioned, herbal and kitchen remedies, which I had distributed after a radio interview, I received a letter from a medical doctor. While agreeing with me about the efficacy of sweet-fern *(Comptonia peregrina)* for the alleviation of poison-ivy distress, he implied that however true such uses of plants might be, "people now want miracles from cortisone or what-not, without realizing with what a two-edged sword they are dealing." Proliferation of synthetic medicines has undoubtedly extended man's life in many ways, and these medicines are with us to stay, but it is true that they are a "two-edged" sword because of their often long-delayed side- and after-effects. And it may be years before we know what the reactions and the answers are.

It is for this reason, among others, that the great pharmaceutical companies are hunting for new drugs from plants with an energy equal to that which they are expending in their continuing search for drugs from inorganic substances.

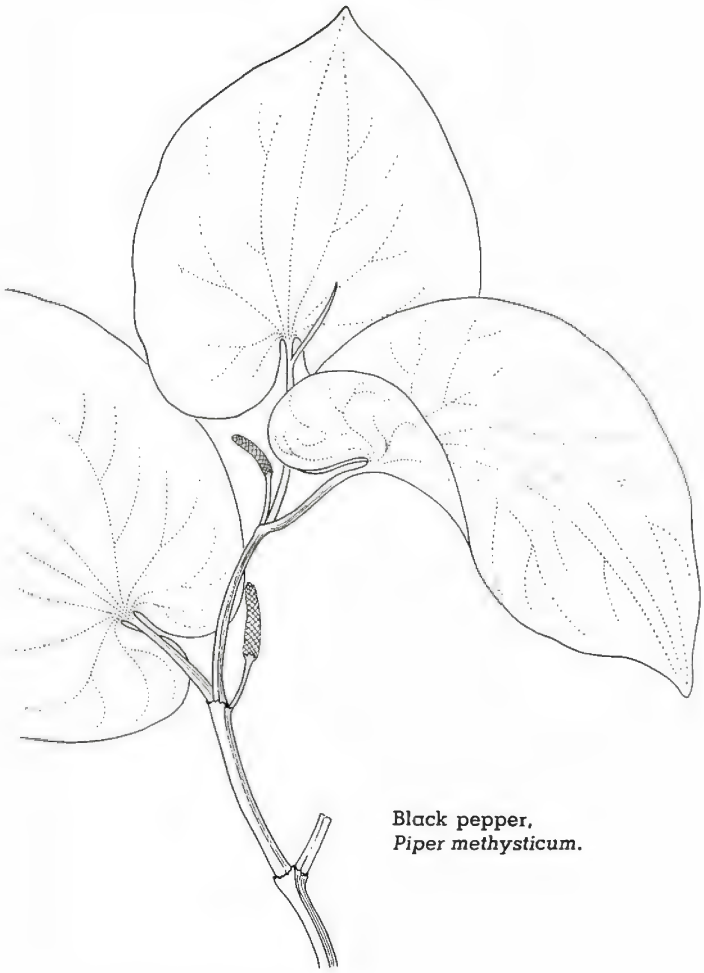
One sympathizes with the general practitioner who must strive to keep abreast with all the research and publication, and at the same time is subjected to the claims of the values, or lack of them, inherent in herbal lore, organic pharmaceuticals, tried (and often true) traditional remedies, commercial cures and their noisy TV advertising, the influences of psychology and religion. All vie for his attention while he attempts to care for the immediate needs of patients!

It is the purpose of this paper to focus on those botanical drugs, or on what might be called "the state of pharmacognosy." According to one druggist with whom I recently talked, more than seventy-five per cent of the plant drugs have been dropped from the "official" lists of suitable medicines, and yet at the same time several plant remedies have assumed major importance within the last decade. The pendulum of medical progress is swinging back and forth as it has done for centuries, pointing successively to the medical practices of the Chinese, whose ephedrine is still an approved medicine, to the Egyptian, the Greek, the Roman, the Moslem, the Mexican, and to a host of other civilizations, all of which tried, with the natural materials at hand, to alleviate and cure the ills of their citizens.

It was often one of the purposes (or at least the consequences) of conquest to discover and utilize the medical knowledge of the conquered peoples. Through such conquest the Chinese and East Indian influences reached the West, Egyptian drugs came to be used by the Greeks and Romans; and later the scientific knowledge of the Moslem world became the basis of our own. It is the reason, too, that the Spanish conquerors sent out doctors and botanists (usually, until a century ago, synonymous terms) to explore the materia medica of the Indians of North and South America, resulting in such notable surveys as that of Francisco Hernandez (ca. 1600) and the *Badianus Manuscript* (1552). From South America at the same time came knowledge of Jesuits' bark, or quinine *(Cinchona),* for the alleviation of fevers, while the supposed values of *Sassafras* for the treatment of syphilis induced (ca. 1600) a rush of commercial exploration. In the American Colonies the male citizen planned ways to control and convert the Indian, while his wife perhaps exchanged home remedies with the squaws who were more often the repositories of practical medical knowledge than were the much-acclaimed "medicine men." A quick survey of the common names of American wild plants shows the many plants, bearing such names as "squaw-berry," having real or supposed medicinal values.

By the time of the American Revolution, medicine was a compound of botanical drugs from many sources, all with a minimum of inorganic materials. In a recently published list of thirty-two drugs designated to be supplied to an Army physician of 1776-78, five are of animal origin, with a small addition of chemicals, such as mercury, sulphur, saltpetre, alum; the rest are herbal remedies. As the uses of medicinal herbs were closely explored in the succeeding century, more plant drugs were added to the pharmacopoeia; thus, as the years advanced into the twentieth century, a multiplicity (if not a confusion) of botanicals was at the command of the general practitioner.

Then came the advance of chemistry, with research speeded in part by the demands of two World Wars and a general feeling among the professions and the laity that *new* chemical and compounds could solve all problems. The spectacular cures effected by penicillin (although itself a botanical), the multiple merits of aspirin, the values of DDT, to say nothing of the mysterious effects of X-rays—these and many other things made



Black pepper,
Piper methysticum.

everyone feel that from the laboratory, rather than the forest, would now come the perfect cures for all the ills of mankind.

Thus, one by one, the botanical drugs disappeared from the *United States Pharmacopoeia* and so, in the schools of pharmacy, there was less need to teach much about the remedies which came from plants. The doctor, with an increasing reservoir of physical and medical knowledge to assimilate, decreased his interest in the properties of plants, knowledge of which was basic for his predecessors. But partly out of the side-results of war and great shifts of population and cultures, the attention of researchers was directed to the effects which certain plant drugs were having (and had had for centuries) on specific diseases in civilizations dependent on empiric and sometimes shaman-administered medical practice.

True, some isolated discoveries by non-professional people had by then been accepted. Digitalis (whose use, discovered in the eighteenth century, is credited to a country lady in Shropshire, England) had long been known as a useful medicine, while quinine had been deemed essential ever since its "discovery." Chaulmoogra oil for leprosy was used in its limited sphere for some decades, but its values did not ameliorate the condition of the populace at large.

Interestingly enough, it is the botanical scientist who, in looking for plants for commercial uses, has stumbled on recognizable, positive cures, or it is the native of some less western-minded country who, in examining his own, rather than "western" medicine, has given us the more recent and notable additions. And these may restore confidence in the virtues of plants.

There is not space to mention all the accomplishments of the botanical explorers who have led the field in these discoveries, but I cannot omit the work of men like Bassett Maguire and William C. Steere of The New York Botanical Garden; of Richard E. Schultes and others of Harvard University; of the laboratory work of Heber W. Youngken[1], and now of his son, in Boston; of Maynard Quimby; of the interest taken in botanical drugs by the Morris Arboretum; and of the explorations of the remote areas of the world by a small army of trained botanists who have recently gone hunting for medical plants at the behest of leading drug companies.

These well-financed pharmaceutical companies have suddenly realized that knowledge may be hidden behind a curtain of magic and in jungle remoteness, and the energetic search by such organizations as Merck, Upjohn, Lilly, Squibb, Ciba, Penick, Johnson and Johnson, and Smith, Kline and French should not go unnoticed. Nor should the impetus given research by the work of financier and philologist R. Gordon Wasson be ignored, any more than the inherited knowledge of the reputable herbalist-doctor be scorned.

Anyone who has read Mr. Wasson's[2] account of his two-decade hunt for and the finding of the hallucinogenic mushroom; or has talked to Richard Schultes[3] of his years along the Amazon in the far reaches of Colombia; or to an Indian (East) doctor, proud of his country's gift to the world of "Reserpine"; or has corresponded with countless housewives about their successful use of many of the remedies which are essentially hand-me-downs from our own Indians, as I have, acknowledges that while much of the primitive past has been revealed, much remains to be unearthed.

Of the more recent accomplishments, several are worthy of mention. One company (Smith, Kline and French) has assayed the possible values in fifteen thousand plants. The National Cancer Institute has screened over fifteen hundred plants for possible cancer cures: of these a small percentage has produced experimental results worthy of further research. Dr. Jonathan A. Hartwell, in charge of this project, tells me in a personal communication that in his opinion the chances for finding cures in the world of plant life for cancerous conditions are just as good as for cures coming from inorganic drugs.

Recent findings have indicated the curative values of periwinkle *(Vinca rosea)* in certain types of leukemia in children, and its values in other cancers are also being explored.

In reviewing the entire plant-drug situation, it appears to me that this resurgence in interest developed through the dramatic use of reserpine, a pure crystaline alkaloid derived from the root of *Rauvolfia serpentina*[4] for the suppression of hypertension. Available under several commercial names only since 1953, it is perhaps as commonly used today as aspirin may have been fifty years ago.

Rauvolfia serpentina.

Among the most dramatic in its effects has been curare, a purely South American Indian invention, now used widely but under much closer supervision. This word invokes the jungle hunter with his arrows dipped in a secretly compounded poisonous drug, which researchers have taken years to separate into its components. Even though it is now known that two plants especially—*Chonodendron tomentosum* and *Strychnos toxifera*—are essentials in the mixture, the name curare still holds. As a relaxant for mental patients, as part of anesthesia, and for specialized uses this almost pure empiric Indian medicine is being utilized for life-*giving* rather than life-*taking* purposes.

The properties in cortisone, a drug familiar to sufferers from arthritis, are basically from a tropical yam, *Dioscorea* sp.

A continuation of the discussion includes *Rivea corymbosa,* which is a source for a drug popularly known as LSD, and the much-discussed (especially by Aldous Huxley) peyote or mescaline. This hallucinogenic drug, which has been used for centuries by southwestern Indians in religious ceremonials is, says Mr. Huxley, a much better sedative and less habit-forming than either alcohol or tobacco. Although use of the mescal button *(Lophophora lewenii)* is presently proscribed, as well as difficult to gather in the wild, we shall probably hear more of this and other drugs which affect the mind as the explorers hunt the "back-country." Such drugs of plant origin are being used with remarkable results under controlled conditions and usually in institutions.

A variety of black pepper, *Piper methysticum,* has only recently been investigated and approved. This has come to us from the South Pacific, while oil of eucalyptus, a common ingredient of medicines for the respiratory tract, came from Australia. Remedies have been made from various species of *Datura,* and some scientists are investigating two long-used plants, May-apple *(Podophyllum peltatum)* and hellebore *(Veratrum viride),* the latter a virulent narcotic from our swamps.

Common in swamps also in many parts of the world is sphagnum moss which has had varied uses as an absorbent, but quite recently investigators have turned to its possible antibacterial value. This exploration of a swamp leads to the water and to the plants which grow in it—both freshwater and salt. Just as scientists are considering the possibilities of feeding the world with the plants and animals which inhabit the depths, so are they taking a look at the medicinal properties of these same things. The value of iodine from sea life has long been known, as has that of red algae (agar-agar), but other values in the seaweeds are suspected.

The lowest forms of plant life, the lichens, are the source material for usnic acid, a "broad-spectrum" antibiotic now being considerably used in Europe. Historical investigations into lichens have shown that their medicinal values were known to the Egyptians, and centuries ago in some countries they were part of a cure for tuberculosis.

The belief in folk medicine, held by a large segment of the public, is evidenced in the popularity of such books as *Folk Medicine* by Dr. D. C. Jarvis; in the persistent demand for medicines of the past reinforced by some of the findings here referred to; and in the alleviation, if not always cure, of minor ailments by inherited remedies. In assembling material for a recent survey of the common medicinal plants of America, I received letters and helpful, often authentic, information about herbal medicine from correspondents in every part of the country.

REFERENCES

1. The Garden Journal 4(5): pp. 152-53.
2. The Garden Journal 8(1): pp. 1-5, bk. cov.
3. Richard Evans Schultes. "The Widening Panorama in Medical Botany" *in* Rhodora, 65(762): pp. 97-120.
4. Joseph Monachino. "Rauvolfia Serpentina" *in* The Garden Journal, 4(5): pp. 152, 153.

Vinca rosea.

Dr. Maria Buchinger.

SHE SPEAKS CONSERVATIONAL SPANISH

By PHIL CLARK

Mr. Clark is Public Relations Counsel of the Field Museum, Chicago. He was formerly Assistant to the Director (Public Relations) at The New York Botanical Garden.

MANY RHAPSODIZE over the grandeur of nature before lands were laid waste by plough, bulldozer, and pesticide. Many even raise sad voices of prophecy pointing beyond aesthetic and economic losses to mounting perils to humanity's very sanity and survival. Many speak of these things, but few do anything.

A not easily ignored exception is Dr. Maria Buchinger. I interviewed this vigorous Argentinian scientist in her Washington, D. C., office and came away impressed with her zeal, energy, and ability and convinced that she has a practical program for conservation of natural resources in Latin America.

Dr. Buchinger is quick to point out that this is not a problem of crisis proportions in Latin America alone but, in varying degrees, a major problem of the whole world. The rapid growth of population, agriculture, and industry in Latin America, however, are accelerating destruction of the very grounds of the future and adding a special urgency there to building an effective program for conservation.

A key to such a program is Dr. Buchinger herself. "I wear three hats," she commented with a vivacious smile. She is head of the Latin American Desk of Nature Conservancy, Chairman of the Preservation and Conservation Committee of the Association for Tropical Biology, and Executive Secretary of the Comité Latinoamericano de Parques Nacionales. The first office gives a vehicle for advancing conservation in Latin America, the second supplies expert consultation from botanists, zoologists, and ecologists, and the third provides official contacts.

Dr. Buchinger is well trained for her central role. An ecologist (dealing with mutual relationships between organisms and their environment), she has twenty-five degrees from universities in Europe, South America, and the United States of America and served for some years in a leading position in the National Forest Service of Argentina. In 1962, she came to the United States on a Guggenheim Fellowship, to undertake research on conservation education.

Two years ago she persuaded Nature Conservancy to set up a Latin American Desk, and since then things have really been happening in the lands to the south.

Before discussing these rapid gains, let me say a few words about the purposes and methods of the Nature Conservancy in the United States, on which the Latin American movements are being patterned. The aims are "to bring about the protection of additional lands and waters — forests, seashores, ponds, streams, islands, deserts, meadows, wetlands, grasslands, gorges and other distinctive aspects of the American landscape— before they disappear forever."

That's straightforward enough, but how is it to be done?

The Conservancy acquires land either by gift or purchase. The money for purchases is raised by local groups or, less frequently, is loaned to the local groups by the Conservancy. Individuals interested in conservation comprise the dues-paying membership, with chapters in thirty states.

"The Conservancy," in a statement of the organization, "preserves natural areas as 'natural museums' so that the natural character of the land is not disturbed. Scientific research and outdoor education are encour-

Canyon of the Deer near Pachuco, Mexico, has become so eroded that even the great white spires of the old man cactus *(Cephalocereus senilis)* are losing their foothold.

Point of Land, El Cabo, on the west coast of Costa Rica, contains typical forest of a vanishing flora-fauna type.

Remnant of virgin forest near Cali, Colombia, is preserved as El Guayabo. Initiative for saving the fifty-five-acre tract began among private citizens.

aged on most areas, which in some cases are turned over to schools as outdoor laboratories. Nondestructive public uses, such as canoeing, hiking, and nature photography, are generally permitted, but construction of artificial features, such as buildings, roads, and dams, is not usually allowed. Management is practiced when necessary to maintain an unusual or threatened species. Usually volunteers near the area act as a management or 'watchdog' group."

To date, the Conservancy in the United States has preserved one hundred and ten areas totaling thirty thousand acres.

The two years of effort in Latin America have resulted in some amazing statistics.

There are several projects each in Argentina, Peru, Ecuador, Costa Rica, Guatemala, Brazil, Chile, Uruguay, Panama, and Colombia and two each in Bolivia and Haiti. Active groups now exist in Argentina, Colombia, Costa Rica, Ecuador, Guatemala, and Panama, with units in formation in five other countries, and discussions with interested persons in Mexico.

Dr. Buchinger stresses three basic points: First, the purpose is to form indigenous groups, not to form a superorganization. The organizations, therefore, are completely national with controls entirely in the hands of the people of the country, as, of course, are the lands. "I feel, very nationalistically, that the people should acquire and maintain their own lands," Dr. Buchinger says emphatically.

Second, Nature Conservancy, by being a one-purpose organization, can cooperative with governments, private organizations, and individuals without being diverted from its objective. Lands come through a variety of channels—from governments, group fund-raising, individual donations, gifts by industries, and bequests.

Crucial is the third point, which keeps lands from being used for other purposes than intended—the reversal clause. This clause, written into all agreements by which Nature Conservancy turns land over to cooperating governments or groups for maintenance, provides that unless the conditions continue to be fulfilled, the land reverts to Nature Conservancy. Thus no forests are being turned into golf courses or wild meadows into playgrounds.

This is the Nature Conservancy—it is a key for Latin Americans, and all Americans, to lock the door against the looting of nature's rich treasury, and to open the door for mankind's enjoyment of its green heritage.

Preserve just below snowline in the Andes in Peru will protect vicuna, which is in danger of extinction, and allow for study and breeding of this graceful animal.

A NEW "OLD FOSSIL"

(Eospermatopteris textilis)

At The New York Botanical Garden

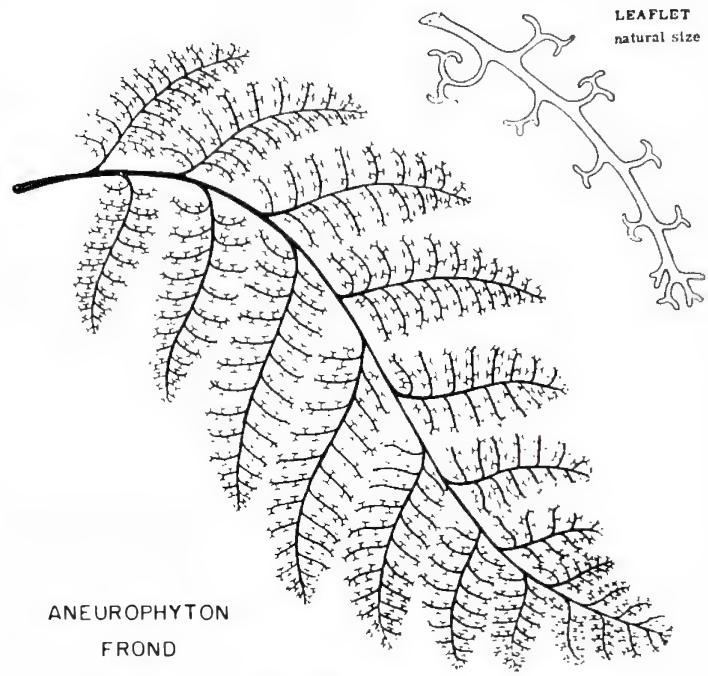
By Herman F. Becker

Dr. Becker is Curator of Paleobotany at The New York Botanical Garden.

Another "old fossil" has arrived at the Paleobotany Department of The New York Botanical Garden. The specimen is really the granddaddy of them all, perhaps one of the first treelike land plants that ever existed on the earth, some four hundred million years old. The elephantine fossil, known as *Eospermatopteris textilis (Aneurophyton),* lived during the middle Devonian Period of geological history. Compared with our plant fossils from Montana of middle Tertiary time, which are the basis of current research, this fossil is just about ten times as old.

Sometime last February, William Glenn of the Physical Science Department of Evander Childs High School in the Bronx, offered us this specimen, saying that it evoked student interest only by its usefulness as a bench, and that it might therefore serve a more lofty purpose at the Garden as an instructive reminder of the evolution of early land plants.

A reconstruction of the Gilboa fern tree, *Eospermatopteris* or *Aneurophyton* (after Dr. Winifred Goldring).



Detail of the fern-like frond of *Aneurophyton* with a leaflet 4/5 natural size.

The black-gray, ribbed stem, of what looks like a tree trunk, is three feet tall from the base, its truncated top is one foot in diameter, and the base measures nearly two feet across. It is, in other words, the lowermost part of a treelike stump with an asymmetrically bulbous expansion to which roots were attached. Root scars, however, are not recognizable in the specimen. This plant was discovered in 1860 near the town of Gilboa in the upper valley of Schoharie Creek north of the Catskills. A flash flood exposed these stumps that were to make paleobotanical history, since they were the first "tree" trunks ever discovered in such ancient deposits. Most of these stumps were found standing upright, suggesting massive flood deposits which buried the lower parts of these plants. Exposed sections of the remaining stumps gradually rotted away, leaving a hollow or natural mold in the now hardened deposits. During the process of decay this mold was gradually filled with sand and silt, and thus the specimens represent casts without internal structure. Only several hundred stumps were taken from a quarry at various levels when the Gibbon Dam was constructed. Now the entire site is under water and no new specimens are available. They are therefore scientifically rare, but a monetary value cannot be placed upon them. Many of the stumps existed in close proximity, forming perhaps the first forest on earth.

Our new specimen has a lateral drill groove and a short drill hole at the cross-section surface, which indicate that the trunk was firmly embedded in the rock and probably not visible during drilling and blasting operations in the quarry. The specimens had to be hoisted out with hooks and crane because of their weight. This fact is something we overlooked when asked to pick up the fossil at Evander Childs High School. In the classroom it took four men using crowbars and two-by-fours to

ease it on a low dolly, but the specimen could not be raised on to the truck until special lift equipment had been provided. The fossil, which weighs between four hundred and five hundred pounds, will soon be displayed on a special pedestal in the Garden's paleobotanical exhibits.

It was only in 1925 that Dr. Winifred Goldring, of the New York State Museum in Albany, studied and described these fossils on the basis of associated frondlike foliage. The plant was called *Eospermatopteris textilis* or *Aneurophyton*, a name which has taxonomic priority by two years. The Gilboa fern tree, which is said to have reached a height of forty feet or more, was a fernlike plant with an unbranched trunk. Its seedlike, sporangial reproductive organs were attached to tripinnate fronds which were from six to nine feet long. Fronds of *Aneurophyton* are also found at Hawk's Nest near Sparrowbush along the Delaware River and in other localities, but the bulbous stems, so far, are strictly confined to Gilboa.

A considerable amount of literature exists on this unusual Devonian plant, but opinions often differ as to its exact taxonomic position and relationship to ancestral and descendant plants. All fossil trunks are casts, and therefore no internal studies can be made to provide precise morphological information. Dr. Chester A. Arnold, of the University of Michigan, discusses the *Eospermatopteris-Aneurophyton* problem at great length in his book *An Introduction to Paleobotany*.

A small and damaged specimen of the Gilboa tree is on exhibit at the Botanical Garden at the present time; the recently donated, excellent specimen is therefore a great asset to our collection.

The New York State Museum and Science Service in Albany has published an informative booklet on the Gilboa fern tree and other Devonian land plants from Naples, New York, entitled *The Oldest Fossil* (Educational Leaflet No. 14) by Janet L. Stone, 1963.

Left. The stump of the Gilboa fern tree with drill marks made when it was hidden from view in the rock of the quarry.
Right. This cast of a fossil stump of Gilboa fern tree, *Eospermatopteris*, is three feet long, nearly two feet wide at the base, and weighs approximately 450 pounds.

HICKORY CHICKENS

By CHARLES O. MASTERS

Mr. Masters, whose vocation is sales with Matheson Scientific of Cleveland, finds relaxation in farming and writing on aquatic plants and animals for those who are interested in gardens and aquariums.

IN SOME OF THE deciduous forest areas of southeastern United States, edible mushrooms have a great variety of unusual names. The morel, or hickory chicken (because it's found so often among hickory leaves), or sponge or honeycomb (because of its general appearance), or delicious morel (because it is delicious), is the most highly prized sac fungus known. And it's also one of the largest!

No one has ever reported the morel as being available in food markets and, to be sure, when it is served in the most exclusive and expensive restaurants, it is there because someone has paid a pretty fancy price to some very secretive collector.

In the entire mushroom world none is more safe for an amateur to pick and eat. There is little danger of confusing the group with any of the poisonous kinds, because of their very characteristic appearance, except for the false morel or *Helvilla (Gyromitra)* which genus includes some species which may be toxic to sensitive people. In fact, Mother Nature was so eager to have man feast safely on morels that she even gave to a few unedibles which might be mistaken for them, an intolerable odor by which to distinguish them. These are called the stinkhorn fungi.

It has been estimated that 165 million pounds of morels are eaten each year in the United States. Some are fried lightly in butter, others sliced raw for use in salads, but a large share get more elaborate treatment. Stalks are split and the entire hollow portion stuffed with chopped cooked veal or chicken, moistened bread or crackers, seasoned, and then tied together before baking. Some are dried for future use. In all cases, however, the mushrooms should be washed carefully before being cooked or dried. Soaking in salt water will help rid them of any insects burrowed down in the pits and will improve the flavor.

For those who may want to know more about what species they may have in their collecting grounds, the following key for identification will help:

1. Margin of cap united to stem:
   Morchella esculenta (L.) Pers., true morel.
   M. deliciosa Fr., delicious morel.
   M. conica Pers., conic morel.
   M. angusticeps Pk., narrow-capped morel.
2. Margin of cap free from stem:
   M. semilibera D. C., half-free morel.
   M. bispora Sor., two-spored morel.

Morels are easily recognized and long remembered after once collected. The characteristic deep pits separated by ridges suggest the appearance of tripe or honeycomb. Specimens will range from one to six inches in length, depending upon species but appearances are similar. All are of a buff color to brown when young,

gradually getting darker with age. The stem is lighter than the hood or cap. The flesh is white.

Anyone who has ever picked violets as a child undoubtedly has seen morels. Those who still don't know where to look for the prized mushrooms will have to content himself with general information about collecting sites. Rest assured, no one who knows where they're plentiful will reveal his secret. The "experts" will give you this much: the best time is a two-week period, depending upon weather factors, during April and May (March in the South) when the ground is moist and the weather warm. The woods must be moist and the ground loamy. Old, uncultivated apple or peach orchards seem to be favorite sites, especially where there has been burning of brush and branches. The scattering of wood ashes also seems to help.

Although they evidently make an appearance each year at one time or other in every state of the Union, morels seem to be in greatest over-all abundance throughout the central and eastern states.

Usually a visit to the woods at the right time will result in finding several dozen morels, but in bright weather, after a showery misty night, a half-bushel load may be possible. At first they are hard to see, but after getting one or two, the rest is easy, if they're there. Sometimes it becomes necessary to move aside some of last year's leaves. Visits to good collecting grounds should not be more often than every other day until the "season" is over. Immediately following rain, when the mushrooms are soaking wet, is a poor time to collect because they spoil quickly after being picked.

Morels are superior in both texture and flavor to any mushroom available, including those grown commercially. They will always be in demand and command a high price. Attempts have been made for years to cultivate them and are still being made. Anyone who succeeds in establishing a reliable method of growing morels and is able to keep it a secret, would soon reap the bountiful financial rewards he so justly deserves.

Hickory chickens, *Morchella sp.*

GERANIUMS (Continued from page 129)

japonicum in *Hortus II,* which includes this statement: "This plant is imperfectly known and material so named in cult. may not belong here." It is not in the R. H. S. *Dictionary.*

We look forward to the first blooms on several new kinds in our garden. The white form of the native cranesbill will be lovely. Shall we like the small, double form of *G. sanguineum* named 'Pixie'? Also, we have planted in the woods a hundred tubers of *G. tuberosum.* Its flowers are described as deep rose-purple to violet, so perhaps we shall have some culling to do. More kinds, too, will come with spring nursery orders, and there are some volunteers of uncertain status.

In general, the cranesbills like a well-drained soil. Those with fuzzy and hairy leaves are better off with sun and plenty of air in our rather muggy summer weather, and the small ones need special places so they will not be crowded and can be admired. Our beds, which slope, are edged with rocks to keep them from washing, and these little plants work in well with the rocks. The upright growers are good on our bank.

The upright kinds would also be good with tall lilies. I think they would be better under our tall Aurelian hybrids than *G. sanguineum album,* which could go under much shorter lilies, or be used as a summer cover with *G. endressii, G. wallichianum,* and *G. "Webbii"* over bulbs.

A wise wind surely could never have sown
The seed of a birch tree upon stone.
Some careless breeze must have wafted it to
A thread of moss and a drop of dew
That caught the seed in a cranny of rock.
And now great stout roots interlock
And the stone is broken, wedged apart
By the roots that pierce to its very heart,
What silent yielding; what desperate need
As the stone gave way to the living seed.

Unknown

PESTICIDES AND THE LIVING LANDSCAPE

A Review

By Virginia A. Weadock

Miss Weadock is a senior research assistant at The New York Botanical Garden and the Editor of *Sarracenia,* a periodical devoted to the various phases of biogeography.

Ever since the late Rachel Carson dropped her pesticide bombshell in 1962, there have been many articles and books plumping one side or the other of the argument. This book, however, is a dispassionate account of an extremely important topic, one too often fraught with emotion and/or vituperation. Reported herein are the results of a no-strings-attached, eight-year-long study which was sponsored by the Conservation Foundation.

This is part textbook, part reference manual, part tragedy. It is not exactly the best seller type, neither is it pedantic. Rudd's analysis of ecological principles (pages 186-188) merits incorporation in any ecology text for any age group. The 310 articles in the Literature Cited constitute a voluminous documentation, chiefly by U. S. and Canadian authors, but with a good representation of foreign titles. The book is divided into twenty-two chapters grouped into six sections, plus an appendix that is an unabridged transcript of the "Recommendations of the President's Scientific Advisory Committee on the Use of Pesticides."

Throughout, Rudd focuses attention on the need to understand the ecology of plants, mammals, insects, fish, reptiles, amphibians, and birds, and the effect on the habitat of the various kinds of pesticides. "Man has been termed an *ecological dominant*—a creature capable of molding his environment to his will, yet independent of it. Biblical allegory reinforced this belief. . ." "We have little enough understanding of the dynamics of biological environments. Yet now we are altering them at a rate that precludes our understanding."

One section is devoted to a "crash course" on the chemistry of pesticides, the philosophy of their use, their economic importance, and the manner of regulation. He distinguishes between toxicity and hazard, outlines testing procedures, and presents a table of toxicity values. In concluding this section, he states, regretfully: "Dependence on use to assess full hazard is the rule, not the exception."

He documents, often with depressing facts, the disastrous effects of too early, too unstudied, and too irresponsible applications of pesticides. Throughout, he urges adoption of the "integrated control concept": chemicals used only to bring pest numbers down to a level where "antagonistic organisms" can take over. In this regard, he devotes one paragraph to a denunciation of entomologists' quick acceptance of chemical as opposed to biological control.

Rudd acknowledges that there is no agreement on what a pest really is, how it should be treated, or what is to be considered: economic gain, hazard to life, recreation, nuisance abatement, aesthetic values, tradition. Too often, he feels, decisions are based on too few data, or on momentary advantage, and that "It is not at all clear that many pest control officials fully appreciate the changes now taking place." And in recent years it has become necessary to provide protection against the control agents!

He stresses the necessity of a thorough knowledge of life-cycles in vector control because of a "Strong emphasis on habitat manipulation. . ." However, ". . . the major problem is unintentional loss of domestic animals or adverse alteration of the habitat of desirable animals." A further change is frequently brought about by accumulation of chemicals or their degradation products in foodstuffs. The National Research Council so far is the only coordinator of pest control, but there is really no control of pesticides themselves, only of marketing. Most legislation is "inconsistent" and too dependent on individual performances. Rudd points out that the National Research Council's Committee on Pest Control and Wildlife Relationships should be the guiding body for legislation and opinion, but that its first two reports were too general, too unscholarly, and ". . . evade the central reason for the committee's formation. . ."

Rudd's Chapter 14 on "Changes in the Biological Landscape" opens with an excellent summary of changes brought about by man's interference with the landscape, the establishment of introduced species because of lack of competitors, the take-over of productive land by so-called weeds, and transformation of some native species from normal levels to pest classification. "By far the greater part of pest control is directed toward correction of imbalances of man's own creation."

Rudd poses some questions which bear quoting: "Does pest control accentuate the existent trend toward simplified biological environments? Does it aid in the dispersal of pest organisms? Are we presently reducing desirable species of plants and animals to extinction through pest control? Are we unknowingly producing changes in biotic make-up over large areas? . . . producing 'biological deserts'?" He answers *yes* to all. He then discusses scientists and the way their studies are approached, the short-term goals, lack of coordination, pressures of special-interest groups, and so on. He makes a serious charge against scientists: that they don't attack the ". . . ecological problems of social significance."

Agriculture in the United States is artificially simplified into "monocultures" which on a small scale do not disturb the biota greatly but over large areas create "catastrophic instability." Monospecific stands of trees are very subject to insect outbreaks so that ecologists now recommend mixed stands. This also applies to range land, much of which has been so depleted that it is desert. Rudd states that the time may come soon

PESTICIDES AND THE LIVING LANDSCAPE. Rudd, Robert L. xiv + 320 pp. Indexed, appendix. University of Wisconsin Press, Madison, Wisconsin. 1964. $6.50.

(Continued on page 158)

NEWS, NOTES and COMMENTS

The Annual Meeting. Distinguished Service Awards were presented at the annual meeting of The New York Botanical Garden held on May 2, 1966, to Mrs. James C. Mackenzie, Peggy McGrath Rockefeller, Rupert Charles Barneby, and Harold William Rickett. Excerpts from the citations follow:

It would be difficult to over-emphasize the great debt which The New York Botanical Garden owes to the Women's Council, that fine group of dedicated women who have done so much to promote and support its many activities. Good organization, such as this group enjoys, does not just happen but results from skillful thought and in this connection one immediately thinks of Mrs. James C. Mackenzie, its tactful and efficient chairman for a term ending December, 1965. It was during her incumbency as chairman and under her guidance that the two women's groups, the Advisory Council and the Advisory Volunteers, were welded into a strong working organization.

Among other imaginative projects initiated by Mrs. Mackenzie was a tea for Mayor Wagner at the Garden, in an effort to interest the Mayor and other City officials in the work of the Garden. This same thought of publicizing the work of the Garden prompted Mrs. Mackenzie to suggest a luncheon at the Garden to make better known to scientists, and the scientific world generally, the important research being done in its laboratories.

Over and above her contributions to The New York Botanical Garden, Mrs. Mackenzie's public interest covers a wide range of charitable activities, both local and national.

For her exceptional service to botany and horticulture through her inspired stewardship on the Women's Council, The New York Botanical Garden is honored to present its Distinguished Service Award to Mrs. James C. Mackenzie, with appreciation and high regard.

Peggy McGrath Rockefeller became a member of the Board of Managers of The New York Botanical Garden on May 15, 1952, as the result of her enthusiasm for gardening and for plants. Her interest in botany was aroused by a course in which she enrolled in 1960, offered by the Garden's Department of Education and given by an outstanding teacher, Dr. H. W. Rickett. At the time, neither student nor professor could have foreseen that they would be closely associated, in a few years, in a great undertaking of common interest, the Wild Flower Book Series.

Ten years ago, Mrs. Rockefeller became aware, at the insistence of friends, of the grave lack of comprehensive and trustworthy books on wild flowers, especially in our national parks of the South and the West. It was wholly natural for a member of its Board of Managers to think first of The New York Botanical Garden as the most appropriate institution to accept the important responsibility for providing definitive books on wild flowers. Because the Garden staff was already fully committed to essential and long-term research programs, Mrs. Rockefeller formed a small committee to raise the necessary funds to provide for new staff. As chairman of this committee, she was able to report at the end of 1962 that sufficient funds were available for the great work to begin. Early in 1963, a start was made on what will be by far the best work ever published in this country on wild flowers, in terms of comprehensiveness, accuracy, nontechnical language, and quality and beauty of color photographs and line drawings.

In recognition of her energy, her enthusiasm, her leadership, her dedication, and her personal generosity in transforming a dream into reality, an idea into the Wild Flowers of the United States, The New York Botanical Garden is pleased and honored to present its Distinguished Service Award to Mrs. David Rockefeller.

Rupert Charles Barneby received his broad classical education at Harrow and Cambridge University, and in 1932 the degree of Bachelor of Arts in history and languages. Interested in botany from childhood, he was enabled by private means to devote much time to field work, as well as general taxonomic and distributional studies, which has made him a widely recognized author of taxonomic investigation.

He collected and studied plants throughout Mediterranean Europe and North Africa from 1931 to 1937 and first visited the United States in 1935. He became a resident in 1939, initially in California and three years later in New York.

Early in his American experience, Mr. Barneby developed a deep interest in the taxonomy and geography of the genus *Astragalus,* a member of the *Leguminosae* or Pea Family. *Astragalus,* one of the larger genera of the world, possesses an intricate and complicated taxonomy, many plants of extreme beauty, and many of economic importance.

After twenty years of intensive field study throughout the North American range of *Astragalus,* and in the major or important herbaria in America and Europe, he published last year what he modestly calls an "Atlas of North American Astragalus." However, this is a profound study in the classic mold, comprising 1,188 pages, and filling Volume 13 of the *Memoirs of The New York Botanical Garden.* Of the nearly four hundred species treated, Mr. Barneby has himself discovered or collected some sixty, which gives indication of his discernment and competence in the field. In August, 1965, the Botanical Society of America presented to Mr. Barneby its Henry Allan Gleason Award for this outstanding publication.

As a suitable *sequela,* Mr. Barneby is now engaged in a parallel taxogeographic study of the genus *Dalea,* shrubby relatives of *Astragalus* which also possess aesthetic and technical appeal.

In 1961 Mr. Barneby was appointed Honorary Curator of Western American Botany, in recognition of the wealth of scholarship and field experience he brings to the Garden. This title acknowledges his high competence as a taxonomic botanist and places a demand on him for advice, counsel, and service to the herbaria. Mr. Barneby has thus joined the distinguished company of Asa Gray, William Jackson Hooker, John Lindley, and others who reached eminence as taxonomists without benefit of formal training in botany.

For these reasons The New York Botanical Garden with esteem presents to Rupert Charles Barneby its Distinguished Service Award.

Harold William Rickett, born in Birmingham, England, in 1896, came as a boy, with his parents, to the United States. He received the degree of Doctor of Philosophy in botany in 1922 from the University of Wisconsin, which had already awarded him the degrees of Bachelor and Master of Arts. After two years as instructor in botany at the University of Wisconsin, Dr. Rickett moved to the University of Missouri to become assistant and then associate professor. In 1939 he was called to The New York Botanical Garden as bibliographer, the position he held until 1963, when he became Senior Botanist for the wild flowers of the United States program. To the wild flower books program Dr. Rickett brought many talents, skills, and experiences which could not possibly have been found in any other individual. He has been the author or editor of several successful books on wild flowers: he has an unusual ability to put scientific information into straightforward and nontechnical English: and he has the true eye of an artist, so necessary both in making and in judging outstanding photographs and drawings. As author and administrator of the wild flower books program, Dr. Rickett will produce a monumental series of five books which are certain to have a profound influence on the American public, in arousing and stimulating its interest in plants.

TWO CONCERTS
BY NEW YORK PHILHARMONIC
on Daffodil Hill
in The New York Botanical Garden
August 4, 1966—8 p.m., Lukas Foss, Conducting
August 12, 1966—8 p.m., Alfred Wallenstein, Conducting

Members Evening, March 31, 1966, at the Biltmore Hotel, New York City: Left, exhibit of tropical plants arranged by the Garden's Horticultural Department; center, display of photographs by Walter Singer, staff photographer, and Natalie Davis, artist for the Native Plant Garden Committee; and right, exhibit of the Wild Flower Books, the first volume of which will be published in October, 1966.

EVENTS AT THE NEW YORK BOTANICAL GARDEN

Women's Council of The New York Botanical Garden entertained Mrs. John Lindsay, wife of the Mayor of the City of New York, at the Garden on April 21, 1966: left, Mrs. Madison H. Lewis, Chairman of the Council, and Mrs. Lindsay touring the grounds on the

"Floral Flyer"; center, Mrs. Lindsay and Mrs. Charles H. Burlingham, Honorary Curator of Exhibits, in the Thompson Memorial Rock Garden; and right, Mrs. Lindsay and Dr. William C. Steere, Director, conversing before the luncheon held in the Snuff Mill.

The Native Plant Garden Committee sponsored a Federated Garden Club Symposium on May 3, 1966. Here members of the Committee and their guests tour the Native Plant Garden. At left, T. H. Everett, Assistant Director (Horticulture) and Senior Curator of Education, is talking with one group with Louis P. Politi, Horticulturist, at the rear. At right, Marco Polo Stufano, Student Horticulturist, is leading another group.

Dr. Rickett has also served with distinction as Chairman of the (international) Committee on Spermatophyta and now as Chairman of the General Committee on Nomenclature and as delegate to several International Botanical Congresses.

The New York Botanical Garden is honored to present its Distinguished Service Award to Harold William Rickett, with appreciation and high regard, in recognition of his many years of service, filled with notable achievements in botany.

Charles B. Harding, President, of The New York Botanical Garden, and Dr. William C. Steere, presented interim reports. Their reports will be published in full at the end of the fiscal year.

Four members were elected to the Corporation: Mrs. Robert DeVecchi, Mrs. Gordon Rentschler, Mrs. Philip D. Wiedel, and Joseph DeF. Junkin. Mr. Junkin was also elected a member of the Board of Managers, class of 1969. The members of the class of 1966 were re-elected for a term of three years with the exception of R. Gordon Wasson, who was made an honorary member of the Board, since he is no longer a resident of the United States.

Activities of the Director and Staff. Dr. William C. Steere, Director, attended a meeting of representatives from various biological organizations to create a Council of Biological Sciences Information, on May 14, 1966, at the National Academy of Sciences in Washington, D. C., and on June 6-11, 1966, participated in a Symposium on the Biota of the Amazon Basin in Belém, Brazil, at which time he presented a paper on "The Bryology of the Amazon Basin." Dr. Steere will participate in the annual meeting of the American Institute of Biological Sciences, to be held at the University of Maryland, College Park, Maryland, on August 14-20, and in the XVII International Horticultural Congress, also to be held at the University of Maryland during the same period. Dr. Steere is a member of the Steering Committee for the Congress and will speak on vocational training of horticulturists at the session devoted to education. He will attend the Eleventh Pacific Science Congress to be held in Tokyo on August 22-September 10, 1966, and will present a paper on "The Distribution of Mosses in the Northern Pacific Area, with special attention to disjunctions." He will also participate in the section of this Congress to be devoted to science information and communication and in several post-Congress excursions.

Dr. Bassett Maguire, Head Curator and Coordinator of Tropical Botany, and Mrs. Maguire left New York on May 6, 1966, for an extended trip to London and thence through the Old World tropics. They traveled in eastern tropical Africa, tropical India, Thailand, Singapore, Indonesia, and the Philippine Island. The purpose of their trip was to observe the tropical vegetation of Africa, southern Asia, and the peripheral archipelagoes.

Dr. Tetsuo Koyama, Associate Curator, lectured on "Flowers and Gardens of Japan as Seen by a Botanist" at the Hudson River Museum in Yonkers, New York, on May 9, 1966. He attended the meeting of the Council and the annual meeting of the Association for Tropical Biology, Inc., held at Belém, Brazil, on June 8 and 9, 1966. He presented a paper, entitled "Recent Advances in the Systematic and Phytogeographical Studies in Neotropical *Cyperaceae*" during the symposium on the Biota of the Amazon Basin held in Belém, June 6-11, 1966.

Dr. Herman F. Becker, Curator of Paleobotany, during the past several months lectured on "Fossil Plants" before the trainee gardeners at the Garden and before the Rusticus Garden Club of Chappaqua; and conducted a nature walk to the native flora section and rock garden, preceded by a short lecture and demonstration on fossils. He engaged in fossil investigations and correlations at the United States National Museum in Washington, D. C., at the Museum of the University of Michigan in Ann Arbor, and at Princeton University, Princeton, New Jersey. Dr. Becker left on June 10, 1966, for extended fossil expeditions in Colorado, Montana, Idaho, and other western states, and will spend a week the end of August in the Museum of the University of California, Berkeley, in fossil investigations and correlations.

Dr. Becker reports that about two hundred fossils of the Grant-Horse Prairie Flora have been photographed in conjunction with identifications and study of this flora; also that James B. Orr of the University of Chicago has donated two hundred and fifty plant fossils from two new localities of the Grant-Horse Prairie Flora.

Dr. Richard M. Klein, Alfred H. Caspary Curator, has lectured before the Departments of Biology of Marquette University, Milwaukee, of the State University of New York at Albany and at Buffalo, and of Hunter College in New York City, the Department of Botany at Rutgers-The State University at New Brunswick, New Jersey, and the Torrey Botanical Club. He presided at the Fifteenth Annual Junior Academy of Sciences of the Catholic Science Council, and chaired the auxin session of the Plant Growth Substance Conference of the New York Academy of Sciences; he also presented a paper at the Conference. Dr. Klein is chairman of a committee to evaluate the role of the Developmental Section of the Botanical Society of America in plant growth and development and has been appointed a member of the standing Committee on Education of the Society. He will attend the meetings of the American Institute of Biological Sciences to be held at the University of Maryland, August 14-20, 1966, presiding at a session of the Developmental Section of the Botanical Society of America during these meetings.

Dr. Arthur Cronquist, Senior Curator, Dr. Clark T. Rogerson, Curator of Crytogamic Herbarium, and Dr. Annette Hervey, Senior Research Associate, will also attend the A.I.B.S. meetings at the University of Maryland.

Dr. Cronquist collected for a month this past spring in Nevada and Arizona and spent several days in the herbaria of Michigan State University and of Rancho Santa Ana-Pomona College at Claremont, California.

Dr. M. S. R. Rair, a postdoctoral organic chemist from the National Chemical Laboratory, Poona, India, has been working in the laboratory of Dr. Marjorie Anchel as a Research Fellow since May, 1966. He came to the Garden as an Exchange Visitor.

Dorothy Ebel Hansell, Editor of *The*

The pools of tropical and hardy water-lilies in the courtyard of the Conservatory are summer features at the Garden. Here the visitors admire the lotus, *Nelumbium nelumbo*.

Garden Journal, attended the annual meeting of the American Rock Garden Society held on May 7 and 8, 1966; the annual meeting of the American Iris Society, May 28-June 1, 1966; a dinner in honor of Roy Hay, prominent English horticulturist and author, and a luncheon in honor of Phillip Alampi, Secretary of Agriculture of the State of New Jersey, and the "Outstanding Citizen of New Jersey for 1965." Mrs. Hansell will attend the International Horticultural Congress to be held at the University of Maryland, August 14-20, and meetings of the American Horticultural Society, the American Association of Botanic Gardens and Arboretums, the Garden Writers Association of America, and other organizations which will convene during the days of the Congress.

Staff Seminars. On April 14, 1966, Dr. Ghillean T. Prance, Associate Curator, addressed the staff and students on "The Taxonomy of *Chrysobalanaceae,*" and on May 12, 1966, Dr. Oswaldo Fidalgo, Research Associate, and Head Biologist of the Cryptogamic Section of the Institute of Botany at São Paulo, Brazil, addressed them on "The Microstructures of *Polyporaceae* and their Application in the Study of *Phellinus pachyphloeus* and its Allies."

VOLUME 3—

From April 1 to 10 we were in the deserts of Arizona—Mrs. Rachel Speiser, artist for the Wild Flower Books, and I. At this time, when the spring rains cease, the desert blooms—or should bloom. Dr. Charles Mason of the University of Arizona said that because of the good rains they had had, a superb display was expected. Actually he was disappointed; but we were not. I have seen photographs of more massive flowering, but we saw plenty. In a rented car we covered 1,435 miles from Tucson to Phoenix to Sedona (with a side trip up to Flagstaff on Sunday) to Yuma to Organ Pipes National Monument and back to Tucson; and from Tucson day trips over the Redington Pass in the Santa Cataline Mountains and to the Desert Museum in the Tucson Mountains. We photographed and collected over eighty species, and sketches were made, in the field, of many of these. Dr. Mason and his staff kindly identified everything. We saw fields of yellow *Lesquerella* (a mustard), golden bushes of *Encelia* (Daisy Family) covering the sides of tall mountains, lupines and desert-marigold *(Baileya)* along the roadsides as if planted there for decoration, and many others. On a smaller scale several lovely flowers awarded us: the desert-lily, *Hesperocallis,* a deep blue *Delphinium,* and the rose-purple *Penstemon parryi.*

A weird world of prickly-pear, cholla, and saguaro, with tall yuccas (in bud) and spiny palo verde, mesquite, and greasewood.

And between all these improbable and hostile vegetables, the earth spread with gold. . .

HAROLD W. RICKETT

VISITORS TO THE GARDEN

Dr. Warren P. Stoutemire, University Herbarium, Michigan State University, East Lansing.

Sharon La Bonde, student, Rutgers-The State University, New Brunswick, N. J.

Gary H. Morton, student, University of Tennessee, Knoxville.

Mark W. Paddock, Missouri Botanical Garden, St. Louis.

Dr. Patricia R. Roberts, University of Brunswick, Canada.

Dr. John R. Reeder, Yale University, New Haven, Conn.

Dr. J. R. Charter, Forest Research Department, Ibadan, Nigeria.

Dr. and Mrs. Frank G. Meyer, United States National Arboretum, Washington, D. C.

Dr. Velva E. Rudd, Dr. Lyman B. Smith, and Dr. John J. Wurdack, Smithsonian Institution, United States National Museum, Washington, D. C.

Dr. Barbara Palser, Rutgers-The State University, New Brunswick, N. J.

Dr. N. A. Sorensen and Dr. J. S. Sorensen, Institutt for Organisk Cjemi, Trondheim, Norway.

Dr. Louis Pyenson, New York State University, Farmingdale, L. I.

Sherman G. Brough, Department of Science Education, University of British Columbia, Vancouver, Canada.

G. G. Hollenberg, Redlands, Calif.

Dr. Roger D. Goos, American Type Culture Collection, Rockville, Md.

Dr. Colin Booth, Commonwealth Mycological Institute, Kew, Surrey, England.

Harold Epstein, widely known in the horticultural world abroad as well as in the United States, and a member of the Corporation of The New York Botanical Garden, was cited by the American Rock Garden Society at its annual meeting on May 7, 1966. The citation reads, in part:

Harold Epstein became a member of the American Rock Garden Society in 1937; within six years he was elected a member of the Board of Directors; within eleven years he was elected President. And, unstinting of time, energy, and enthusiasm, he filled that office most capably until 1964.

His interest in rock gardening was aroused only three years after his initial interest in gardening began, and it culminated in the artistically designed and well-planted rock garden which furnishes such a beautiful setting for his home in Larchmont, New York.

Harold Epstein has grown a wide variety of plants from this and foreign countries. The "easy doers" are not for him, only the difficult ones which challenge a grower's knowledge of the plants' habitats as well as his cultural ability. He delights in showing the plants that grace his rock garden and that fill his greenhouse benches and propagating beds. He enjoys the stimulation which comes from comparing notes with well-informed plantsmen, both in person and by widespread correspondence.

While rock gardening and the American Rock Garden Society have commanded Harold Epstein's first attention, his horticultural interests have not been confined to them. He has served the Hortus Club of New York as President for the past fourteen years, the American Orchid Society as trustee, the Horticultural Society as director, and is a past president of the Greater New York Orchid Society and the Men's Garden Club of New York, and a member of and actively interested in many other horticultural organizations and specialized plant societies.

Lois Woodward Paul has received the Distinguished Achievement Award of the Pennsylvania Horticultural Society. The citation reads:

"This award is presented to you for your dedication to education in horticulture and garden design; for your ability to persuade and help those with practical gardening skills to share their knowledge in the classroom; for your own good taste and high standards in teaching; for the new visions you have given to young and old in the creation and enjoyment of beauty."

Mrs. Paul is Supervisor of Education at Longwood Gardens, Kennett Square, Pennsylvania, in charge of its short course program and Horticultural Information Service. A graduate of Ambler School of Horticulture for Women, now a division of Temple University, she attended the Cambridge School of Architecture, studied landscape and architecture at Smith College, and has taught and lectured extensively.

The Third Congress of Mexican Botany will be conducted October 24-28, 1966, in Mexico City, it was announced this week by officers of La Sociedad Botánica de México, which will observe its silver anniversary during the Congress.

Sections will include those on botanical history and bibliography, cryptogamic botany, phanerogamic botany, plant morphology, plant physiology, paleobotany, plant cytology, phytogeography, plant ecology, and economic botany. Symposiums, round tables, and conferences will be organized and excursions of botanical interest will be scheduled.

Officers of the committee in charge are: Biól. Javier Valdés Gutiérrez, Ing. Salvador Miranda Colín, Biól. José Sarukhán

(Continued on page 162)

The 1966-1967 Education Program

of day and evening courses in botany and gardening and the complete fall 1966 schedule of Saturday Afternoon Lectures will be available August 15, 1966.

Request for a copy of the Education Program or of the schedule of Lectures should be addressed to The Education Department, The New York Botanical Garden, Bronx, New York 10458.

PESTICIDES AND THE LIVING LANDSCAPE

(Continued from page 153)

"... when total ecological management will have gained as much acceptance as have the varied, fractionated management disciplines that are concerned with it."

In a chapter on "Food Chains and Pesticides: Substitution and Competition," he discusses direct and indirect responses to chemical control, secondary poisoning, delayed expression, buffer species, artificial manipulation of populations, carrying capacity of land, floristic shifts. He feels that emphasis on competition is probably overstated, and that cyclic outbreaks are another result of biotic simplification.

Delayed expression is becoming one of the greatest hazards because chemical compounds increase their concentration as they pass from one host to another. For humans, cooking reduces DDT residues by only ten per cent. Death of birds, for instance, may have three causes: direct poisoning, water-logging by oil film on the water, and assimilation of toxic materials from contaminated water. Some of these chemical residues may remain toxic for many months after application. Many useful species may be killed along with the pests, and in so doing the pest's natural controlling agent is also eliminated; resistance is developed over a period of time, resulting in the need for stronger chemicals and/or more frequent application.

In his "Retrospect and Prospect" section, Rudd emphasizes how "... control methods have departed from fundamental biological principles. ." "Present chemical pest control practices are often an incongruous mixture of actual need, superficial appraisal, unbalanced perspective, and expediency."

One may ask what has been accomplished in this publication? The main point made by the author is that we do not have a thorough enough knowledge of the ecosystems of the land and water and their interrelationships. In spite of this lack, the producers and consumers of pesticides have forged ahead, often blindly, with too little thought about side-effects and after-effects of their actions.

Rudd emphasizes that he does not condemn outright all pesticide programs—he only urges more biological control in conjunction with basic chemical control as a delaying action until natural predators can function. He calls this "ecological management" and stresses that the "... ecological manager be considered the primary source of pest control recommendations." He points out the need for more cooperation among international agencies, with broader studies of *whole* problems, because pests are a worldwide concern today. Insidious effects are gradually accumulating in our landscape, and we must coordinate now before more permanent damage is done.

BOOK REVIEWS

TROPICAL GARDENING. Greensill, T. M. 272 pages, illustrated. Frederick A. Praeger Publishers, New York, N. Y. 1966. $8.95.

Here is a much-needed, long awaited book—a volume on tropical gardening which has the ring of authentic home-gardening experience and at the same time covers a wide range of tropical materials. It will be a valuable addition to the garden library of residents of the tropical and subtropical parts of the world.

The author has extensive gardening experience in western Africa and in the Bahamas.

PHIL CLARK
Chicago, Ill.

COMPLETE BOOK OF GARDENING UNDER LIGHTS. McDonald, Elvin. 215 pages, illustrated (part color), indexed. Doubleday & Company, New York, N. Y. 1966. $4.95.

This book is directed towards three categories of readers. From those who, as the author describes them, are "No Nothings" to those who are successful out-of-doors gardeners. This latter group, too, will find the book extremely helpful in suggestions for seed growing and propagation under artificial lights. To this group especially he gives the latest ideas and methods and knowledge about the science of phytoillumination.

The book is clearly written, and even the amateur will find the definitions and explanations of the effects of light media on plant growth easily understandable. If the first chapter is too technical for the tyro, he may skip it and then find engrossing material in the succeeding chapters. In the chapter on "Pushbutton Solariums," Mr. McDonald gives a general idea of the cost of operation of these artificial lights. This is very valuable—I have never found it in any other book on this subject. The chapter on "Decorative Lights and Planters" is well illustrated and shows many types of materials suitable for the home or office. Under these categories the author includes "Lighted Miniature Gardens," "Electrically Lighted Office Gardens," and "Lighted Plant Cabinets."

The chapter on plant propagation is excellent both for indoor and outdoor gardeners. The author touches on hybridization as well as regular seed propagation.

A chapter is devoted to "Decorative Gardens" which save space and time; these include miniatures, cacti, bottle gardens, terrariums, and so on. One section which I found very suggestive described underwater gardens and aquariums. With the proper use of lights, these can be delightful decorative adjuncts.

The final chapter gives a comprehensive list of sources for purchasing special fluorescent lights and equipment in various parts of the United States and a list of sources for purchasing plants to grow under lights.

This book is so filled with excellent material and so well illustrated throughout that I am adding it to my own library.

MARION S. GANS
Scarsdale, N. Y.

FAMILIAR GARDEN BIRDS OF AMERICA. Collins, Henry Hill, Jr. and Ned R. Boyajian. 309 pages, illustrated (part color), indexed. Harper & Row, New York, N. Y. 1965. $7.95.

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This book is one of the Familiar Natural History Books. The first impression is that it is just another bird book, and the second that it goes all over the place, giving western birds which an Easterner seldom sees. However, quotations from bird students throughout the United States with a biographical word or phrase shows the authority for the statements given. There are references to studies of the Department of Agriculture, bird-banding reports, and Audubon Christmas bird-counts.

This is not a book for children, but rather for adults and not only for beginners at that. The increases as well as the decreases in bird population in relation to the changes in this country from forest and farmland to great stretches of suburban housing is often discussed. In no other recent bird book have I seen so much mention of bird evolution, ecology, migration, natural food, preferred food at feeding stations, descriptions of nests, eggs, song, and "Peck Order."

Of the Baltimore and orchard orioles, Mr. Collins writes: "When two similar-appearing species occur together, casual observers know only the more conspicuous by name. The Baltimore is familiar to everyone; the orchard is passed over as an individual variant or is not differentiated at all."

Although there are many startling and interesting statements about common birds, I can quote only a few in a short review. In describing the flight of a ruby-throated humming bird from Louisiana to the top of Yucatan, 575 miles in ten hours at 30 mph., with seventy-five wingbeats a second, the bird uses only three-fortieths of an ounce of fat as fuel, barely the weight of a copper cent! Bluejays go through the process of "anting." A fledgeling raised by F. W. Miller in his home developed the fascinating habit of seizing a burning cigarette in its bill and "anting" or, in this case, dressing the under surface of its wing feathers with the burning end. Red-breasted nuthatches have an unusual habit of flying straight in [to the nest] without perching on the edge of the entrance hole. On occasion a "fishing robin" has been known to take a trout fry from newly stocked streams. The blackbirds *(Icteridae),* as well as the hummingbirds, originated in the Western Hemisphere, but the common redpoll nests around the globe in arctic and subarctic regions. F. E. L. Beal estimated that each tree sparrow eats, on an average, one quarter of an ounce of weed seeds a day. During its winter stay in Iowa, the species as a whole consumes 875 tons of weed seeds each year, the equivalent of the tonnage carried by a long freight train. White-throated sparrows, studied by Albert Wolfron at Evanston, Illinois, were found to add enough fat before migrating for a night flight of from 270 to 360 miles at 30 mph.

The author praises the house or English sparrow for the good it does, explains that both it and the starling, which were imported from the more densely populated countries of Europe, have more easily fitted into our spreading cities than many of our own native birds. Crabgrass seed is one of their favorite foods, and they also eat considerable quantities of chickweed, dandelion, and ragweed seeds.

Mr. Collins died before this book was finished. Mr. Boyajian, President of the Linnaean Society, completed it by adding a number of species accounts.

GRACE COIT MELENEY
White Plains, N. Y.

HERBS: THE SPICE OF A GARDENER'S LIFE. Williams, Katherine Barnes. 174 pages, illustrated, indexed. Diversity Books, Kansas City, Mo. 1965 (rec'd. 1966). $5.95.

That herbs are the spice of Mrs. Williams' life is clearly evidenced by her book, which took nearly twenty years to reach the printer because she "kept learning and experiencing — and revising the manuscript."

But the years furnished the answers, here documented, on why to grow herbs, how to grow them, where to find the plants and seeds, what to do with them at harvest time. Every aspect of the age-old, yet most modern husbandry of herbary is discussed in simple terms primarily for the person whose herb garden is still just a gleam in his eye. "I am no botanist, nor skilled horticulturist. . . I am not scientifically trained, but write as an amateur for amateurs, especially for real beginners."

In an informal style Mrs. Williams records her successes and, with disarming honesty, her failures; she lists plants of easy cultivation and those for the more ambitious gardener; she outlines garden design with specific information on height and habit of growth of the species depending on the locale; she tells how to pronounce the names and offers a bibliography of the best books to read on the subject.

One chapter reveals fascinating instruction on the use of herbs in arts and crafts, the making of vandyke brown-prints and blue-prints, pomanders, pot-pourri, tussie-mussies. Here, also, are the mouth-watering gourmet recipes which give stature to any hostess.

Best of all are the beautiful illustrations with new line drawings, wood cuts from old herbals (one wishes that the source for these had been given), and portraits by foremost plant photographers.

The chatty presentation does not bemuse the message which comes through loud and clear. Mrs. Williams has enjoyed her many years of working with herbs and wishes to share this pleasure with others in a book which reflects a good way of life.

ELEANOR B. GAMBEE
Englewood, N. J.

ALL ABOUT ROCK GARDENS AND PLANTS. Kolaga, Walter A. 385 pages, illustrated, indexed. Doubleday & Company, New York, N. Y. 1966. $4.95.

Mr. Kolaga has written a useful book, long-needed, for Americans wondering how to get started in experiencing "the unlimited pleasures of rock gardening." He sets himself to prove a paradox, that natural rock gardening can be easy and enchanting—and that it represents the peak of attainment in gardening skill. Both contradictory statements are true. Any gardener smart enough to read a book like Mr. Kolaga's can make a rock garden which will give him great pleasure and excitement—and if he is a little bit smarter, he can spend the rest of his life learning what was wrong with it and building better and better ones. The first thing he must learn about rock gardens and plants," which Mr. Kolaga himself knows. The title is one of those things which all Christians and other people of good-will must forgive publishers.

Most of the good books on rock gardening have been written by British authors and based on British experience and climate. Mr. Kolaga's book is based solidly on his own wide experience in the northeastern United States.

The first third of the book consists of elementary chapters on types of rock gardens, location and exposure, construction, soil composition, planting and maintenance, background and approach planting. Over two hundred pages are then devoted to discussions of the basic plants with cultural direction and description. To make this section most useful to American gardeners, Mr. Kolaga has itemized those plants currently available (not easily available, let it be said, but somehow obtainable by the determined and resourceful).

This general text is followed by short chapters on rock garden bulbs, annuals in the rock garden, and conifers of dwarf habit and odd form. There is a useful appendix. Publisher and author would do well to add a short glossary on special terms, such as cespitose, talus, stratification and so on.

The presently unique value of this book to American gardeners is that it is the first elementary but comprehensive book exclusively on rock gardening (since the pioneer days of Louise Beebe Wilder) based solidly on experience in northeastern America. George Schenk's *Rock Gardens* (1964) is based largely on experience in western America, though valuable to us all. Undoubtedly, other books will follow and be welcomed.

Every reader of Mr. Kolaga's book, if reading it does him any good, should immediately spend another dollar and a half for *The Rock Gardener's Handbook* just published by The American Rock Garden Society.

HENRY R. FULLER
Easton, Conn.

THE ROCK GARDENER'S HANDBOOK. 138 pages, illustrated, bibliography. The American Rock Garden Society. 1965. Hard cover $2.50, paper $1.50.

A committee—Harold Epstein, President Emeritus, H. Lincoln Foster, President, Lawrence Hochheimer, Secretary, and John P. Osborne, Director—prepared the Handbook from the excellent material which has been published in the Society's Bulletin since January, 1943. A difficult task, but they carried out their assignment

well. It will appeal especially to the amateur eager for reliable information on rock gardening—how to build, plant, and care for, what plants to grow, and the like.

THE IRIS BOOK. Price, Molly. 204 pages, glossary, illustrated, indexed. D. Van Nostrand Company, Princeton, N. J. 1966. $7.95.

While primarily about irises, this book will be a worthy addition to any gardener's collection. Mrs. Price writes from long experience in her southern New York garden. Of especial interest is her grouping of *Iris* species and their hybrids for the rock garden, the sunny garden, and the shady garden with their companion plants.

There are some superb line drawings, a number of black and white photographs, and four color plates; some useful lists, one giving height, blooming season, color, and planting time, another a source of plants and seeds. The chapter on hybridizing gives brief instruction in genetics.

Written in a nontechnical, pleasantly informal style, the book will be a boon to the beginner with irises, and will surely tempt the specialist to try some of the seldom-seen exotics.

DOROTHY DENNIS
Hot Springs, Arkansas

GROWING ORCHIDS FOR PLEASURE. Garrard, Jeanne. 302 pages, illustrated (part color), indexed. A. S. Barnes & Company, Cranbury, N. J. (distributors). 1966. $7.50.

The burgeoning diversion of orchid growing should allow room for another book directed to the neophyte hobby grower, and this one, in fact, contains information of interest and use to all but the most expert. Miss Garrard has struck a nice balance, the book being written in an informal and personal style but at the same time covering quite thoroughly and accurately the culture of orchids, facts of significance concerning the *Orchidaceae*, the orchid hobbyists' world (orchidists have become rather highly organized), and the appreciation of peripheral interests such as corsage-making. Detailed coverage of special situations such as window growing, basement growing, and backyard culture in subtropical climates, in addition to instructions applicable to more usual greenhouse culture, broaden the appeal of this book.

The author writes from the position of a seasoned orchid grower and careful observer, and her enthusiasm, while controlled, engenders interest in the reader for this horticultural specialty.

H. P. JESUP
Bristol, Conn.

BRIEF NOTES ON RECENT BOOKS

FLOWERS

THE ROCKWELL'S COMPLETE BOOK OF ROSES. Rockwell, F. F. and Esther C. Grayson. 332 pages, illustrated (part color), indexed, addenda. Doubleday & Co., New York, N. Y. 1966. $5.95.

The Rockwells have been growing roses for a number of years in different locations under a variety of conditions, so the information they impart on the use, selection, planting, and culture of roses can be depended upon.

The Rockwells have revised their book on roses, first published in 1958, and updated their lists of recommended varieties. Exhibiting roses, arranging roses for show and for the home, and making jams, jellies, and potpourris have not been overlooked.

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FLOWERS OF THE MEDITERRANEAN. Polunin, Oleg and Anthony Huxley. 257 pages, illustrated (part color), indexed. Houghton Mifflin Company, Boston. 1966. $9.75.

Some seven hundred of the more interesting and showy plants of this region are described, with three hundred illustrated in color and over one hundred by line drawings. A good guidebook for the visitor to Spain, the Riviera, Greece, Lebanon, and Turkey, and a nice addition to the library of the gardener who enjoys becoming acquainted with the native plants of a particular area.

AFRICAN VIOLET AND GESNERIAD QUESTIONS—Answered by 20 Experts. Wilson, Helen Van Pelt (ed.). 272 pages, illustrated, indexed. D. Van Nostrand Company, Princeton, N. J. 1966. $6.95.

The number of African violet growers has increased so greatly and likewise enthusiasm for the popular home plant, since *1001 African Violet Questions Answered by Twelve Experts* appeared in 1958, that the publishers decided it was time to answer the questions which arise today about saintpaulia and its relatives, such as achimenes, aeschynanthus, chiritas, columneas, espiscias, gloxinias, and so on.

The experts hail from Australia, Canada, and England, as well as from the North, South, East and West in the United States. Among the experts whose names are familiar to readers of *The Garden Journal* are Paul Arnold, Elaine C. Cherry, Dr. Sheldon C. Reed, and Alma Wright.

THE PICTURE BOOK OF ANNUALS. Nehrling, Arno and Irene. 208 pages, illustrated (part color), indexed. Hearthside Press, Inc., New York, N. Y. 1966. $6.95.

This appraisal of annuals from A to Z by a team of well-known horticulturists will prove useful to the novice and the experienced gardener. This companion volume to *The Picture Book of Perennials* not only includes a description of many annuals but chapters on raising them from seed and from cuttings, monthly schedules on what to do, and the ways in which annuals can be effectively used to enhance the beauty of the home garden.

FLOWER ARRANGEMENT

THE ART OF JAPANESE FLOWER ARRANGEMENT. Coe, Stella. 158 pages, illustrated, glossary. The John Day Company, New York, N. Y. 1966. $5.00.

Mrs. Coe, who studied at the Sogetsu School in Tokyo for six years, qualifying as a teacher of Ikebana, presents arrange-

ments of this art from basic to most complicated. The illustrations and the glossary of terms help the reader to understand more fully her instructions.

THE DRIFTWOOD BOOK. Thompson, Mary E. 248 pages, illustrated, indexed. D. Van Nostrand Company, Princeton, N. J. 1966. $5.95.

A revised and enlarged edition of *The Driftwood Book,* first published six years ago. New directions and thirty illustrations have been added.

Mrs. Thompson lectures as well as writes on flower arrangement and is an accredited flower show judge. Her book is illustrated by Leonid Skversky, one of this country's foremost floral photographers.

FLOWER ARRANGEMENT. Stockwell, Betty. 132 pages, illustrated (part color), indexed. Leisure Time Books, New Rochelle, N. Y. 1966. $11.75.

Flower Arrangement, which made its initial appearance in England in 1964, is now available in this country. In a book, well illustrated not only with pleasing colored and black and white photographs, but with line drawings to emphasize specific points, Mrs. Stockwell gives clear instructions which a beginner can grasp and follow.

GARDENING AND LANDSCAPING

THE FLOWERING GREENHOUSE DAY BY DAY. McDonald, Elvin. 158 pages, illustrated, indexed, appendix. D. Van Nostrand Company, Princeton, N. J. 1966. $6.95.

This very useful book for the amateur greenhouse grower reflects the author's experiences in his own greenhouse and the observations he has made when visiting his friends' greenhouses, and takes into consideration the information culled from a questionnaire circulated among one thousand owners of home greenhouses.

1001 WESTERN GARDEN QUESTIONS ANSWERED. Gillespie, Norvell. 239 pages, glossary, indexed. D. Van Nostrand Company, Princeton, N. J. 1966. $6.95.

Mr. Gillespie has taught horticulture and has written many articles and several books on various aspects of horticulture. His latest book is made up of some of the many questions he has answered through his popular newspaper column and radio and TV programs.

AROUND THE GARDEN WEEK BY WEEK. Faust, Joan Lee. 120 pages, illustrated, indexed. Appleton-Century Channel Press, New York, N. Y. 1966. $3.95.

This book is based on Miss Faust's weekly column in *The New York Times,* of which she is Garden Editor. It is a practical calendar for the busy home gardener.

GARDEN GUIDE. Koch-Isenburg, Ludwig. 251 pages, illustrated, indexed. The Viking Press, Inc., New York, N. Y. 1966. $5.95.

Published in Darmstadt, Germany, in 1964; translated into English and published in London in 1965; and now published in New York in 1966, this book will please all gardeners. It is informative, delightfully written, and nicely illustrated with sharp black and white photographs, several good colored photographs, and attractive pen and ink sketches.

The author, who has his own extensive ornamental gardens, has traveled widely, viewing and studying plants.

MAGIC OF TREES AND STONES—SECRETS OF JAPANESE GARDENING. Saito, Katsuo and Sadgii Wada. 282 pages, bibliography, glossary, illustrated, indexed. Japan Publications Trading Co., Rutland, Vermont. 1966. $12.50.

This book, the first edition of which appeared in 1964, in word and in picture (it is profusely illustrated) reveals the important points of Japanese gardening—the planting and planning, the arrangement of stones, the placing and construction of water features. Of special appeal to modern gardeners are the imaginative treatment of such areas as interior gardens and rooftop gardens.

The senior author, Mr. Saito, studied the art of gardening with his father and under Dr. Tsuyoski Tamura, an authority on Japanese gardening, and has practiced the art for fifty years. Mr. Wada, who was graduated from the Tokyo College of Agriculture, is president of a nursery and his constructed a number of gardens in cooperation with Mr. Saito.

LANDSCAPING AND OUTDOOR LIVING—THE LADIES HOME JOURNAL BOOK OF. Pratt, Richard, 225 pages, illustrated (part color), indexed. Grosset and Dunlap, New York, N. Y. 1966. $4.95.

The original of this stimulating and provocative "idea book" on developing the home grounds for modern living appeared in 1963. In addition to ideas and plans, there are lists of bulbs, shrubs, vines, and perennials and suggestions for their use, and a list of botanic gardens and arboretums where one may see plants and their growing habits before deciding what to purchase for one's property.

TREES

SHADE AND ORNAMENTAL TREES IN COLOR. Flemer, William III. 144 pages, illustrated (some black and white, mostly colored), indexed. Grosset & Dunlap, New York, N. Y. 1965 (rec'd. 1966). $4.95.

New home owners may turn to this book with confidence, for the author loves and knows trees and offers sound advice on what kind to select for a particular climate and situation, and on tree planting and care.

The illustrations, showing the habit of the tree, and frequently the flower and/or fruit, enhance the usefulness of this book.

NORTH AMERICAN TREES. Preston, Richard J., Jr. 395 pages, illustrated, indexed. The M.I.T. Press, Cambridge, Mass. 1966.

This is the third edition of the manual of the trees of North America, with the exception of Mexico and tropical kinds found in the lower southern portion of the United States—useful for the nontechnical reader as well as for a student or scientist.

MISCELLANY

FORESTRY IN COMMUNIST CHINA. Richardson, S. D. 237 pages, illustrated, indices, appendices. The John Hopkins Press, Baltimore. 1966. $6.95.

The author, Director of Research for the New Zealand Forest Service, was one of the first western foresters to tour (1963) Communist China. He has been cited by *American Forests* for his work as observer and reporter.

His book, the first comprehensive account of forestry and forest industries in Communist China, is accompanied by a general account of economic, agricultural, water conservancy, and other problems which affect foresrty.

The chapter on "The Natural Vegetation, Soils, and Land Use" and several of the appendices, particularly Appendix IV on "Notes on Some Species of Northwest China Used in Sand Stabilization" should interest ecologists and conservationists.

WHEAT, BOTANY, CULTIVATION AND UTILIZATION. Peterson, R. F. 422 pages, illustrated, indexed. John Wiley and Sons, New York. 1965. (received 1966). $16.00.

From this book, one of the "World Crops Books" series edited by Professor Nicholas Polunin, the general reader and student will gain a broad view of wheat on a worldwide basis.

The morpholgy, physiology, cytology, and genetics of the genus *Triticum* are covered, as are the origin and history of the species and varieties, distribution, breeding, cultivating, harvesting, threshing, and storing, and utilization of the grain.

ADVANCES IN BOTANICAL RESEARCH, Vol. 2. Preston, R. D. (ed.) 382 pages, illustrated, indexed. Academic Press, Inc., New York, N. Y. 1965 (received 1966). $12.00.

This volume consists of six papers which are concerned with the progress made recently in different aspects of botanical research.

The titles of the six papers, all presented by notable scientists in their respective fields, are: "Some Phyletic Implications of Flagellar Structure in Plants," "Fundamental Problems in Numerical Taxonomy," "Ultra-structure of the Wall in Growing Cells and Its Relation to the Direction of the Growth," "The Protein Component of Primary Cell Walls," "Embryology in Relation to Physiology and Genetics," and "The Soft Rot Fungi."

AFRICA—A NATURAL HISTORY. Brown, Leslie. 299 pages, illustrated (part color), indexed. Random House, Inc., New York, N. Y. 1965. $20.00.

This superbly illustrated volume, in the series "The Continents We Live On," depicts the origin, climate, geology, and vegetation of the habitats of the African mammals, birds, insects, butterflies, etc.

The author, an ecologist and zoologist, who rose to the position of Chief Agriculturist of Kenya, has arranged his fascinating material in eighteen ecological regions. While he has left government service, he still resides in Kenya. Mr. Brown has traveled widely in India, Europe, and the United States.

BIRD STUDIES ON CAPE MAY, Volumes I and II. Stone, Witmer. 941 pages, illustrated, indexed. Dover Publications, New York, N. Y. 1965. Paper, each volume $2.75.

Roger Tory Peterson has written an interesting introduction to this unabridged publication of the work originally published by the Delaware Valley Ornithological Club in 1937. When Mr. Peterson was a teenager, he met Mr. Stone, one of the great field ornithologists of his day, at Cape May. A list of species recorded at Cape May since 1937 and a biographical sketch on Mr. Stone have also been added.

THE WORLD OF PLANTS. 158 pages, illustrated (part color), indexed. Doubleday & Company, Inc., Garden City, New York. 1965. $9.95.

This volume, No. 3 in the *Encyclopedia of the Life Sciences,* was produced under the direction of Pierre Chouard, Professor of the Sorbonne, and Jean-Paul Nitsch, Deputy Director of the Phytotron, C. N. R.S., France, and the collaboration of notable scientists of France, the United Kingdom, The Netherlands, and the United States. Among the latter are Dr. Pierre Dansereau, Assistant Director (Botany), The New York Botanical Garden; Dr. Kenneth V. Thimann, Harvard University; Dr. James Bonner, California Institute of Technology.

The readable articles, for layman as well as student, provide a broad coverage of botany in six parts: Colonization of the Mineral World, Elaboration of a Plant in Vetro; The Variety of the Plant World; Internal Regulatory Mechanisms; The Climates and Seasons; and Domestication of Plants.

PHARMACOGNOSY. Claus, Edward P. and Varro E. Tyler, Jr. 572 pages, illustrated, indexed. Lea & Febiger, Philadelphia. 1965. $15.00.

In this fifth edition of *Pharmacognosy,* the first edition of which appeared in 1936, the authors have revised and updated the text to reflect the changes within recent years underlying this science, and the changing world conditions which affect the commercial sources of many drugs.

This is a valuable work not only for students in pharmacognosy and medicine, but for plant physiologists and those interested in economic botany and kindred subjects.

PLANT GALLS AND GALL MAKERS. Felt, Ephraim Porter. 364 pages, illustrated, indexed. Hafner Publishing Company, New York, N. Y. 1965. $10.75.

This is a facsimile of the 1940 edition of Dr. Felt's book—a guide to the identification of two thousand different plant galls found in North America—which has been out of print for some years.

BIOCHEMICAL DIMENSIONS OF PHOTOSYNTHESIS. Krogman, David W. and Wendell H. Powers (eds.). 124 pages, illustrated, indexed. Wayne State University Press, Detroit. 1965. $5.00.

This is a compilation of the papers which were presented at a lecture series, "Frontiers in Chemistry" at Wayne State University in 1964—the lectures and publication thereof being sponsored by the Alumni Association of the University in connection with a Research Recognition Grant to Dr. Krogmann. Chapters include "Two Light Reactions in Photosynthesis," "Mutations of Unicellular Green Algae and their Application to Studies on the Mechanism of Photosynthesis," "Studies in Photosynthesis Using All Tree Preparations of Blue-Green Algae," "The Energy Conversion Reactions of Photosynthesis," "Selective Inhibitors of Photosynthesis," "Respiration During Photosynthesis."

NORTH AMERICAN LANDSCAPE. Monkhouse, F. J., and A. V. Hardy. 96 pages, illustrated. Cambridge University Press, New York, N. Y. 1965. Cloth $3.75, paper $1.75.

Arranged in regional sections, eight of the United States and seven of Canada, this book is primarily for the student of geography. However, the lay person will enjoy *North American Landscape* for the authors present their material in an interesting and understandable manner. This study, largely a detailed interpretation of photographs on physical, human, and economic geography, will serve as a fine supplement to textbooks on North American geography.

CONSERVATION OF NATURAL RESOURCES. Smith, Guy-Harold (ed.). 533 pages, illustrated, indexed. John Wiley & Sons, Inc., New York, N. Y. 1965. $9.95.

The concept of conservation and the problems and the methods of these problems have changed considerably since the first appearance of this book in 1950 and even of the second edition in 1958. In this latest edition there is evidence of a more optimistic outlook brought about by the increasing emphasis on research and man's resourcefulness in meeting his needs, and by the awareness on the part of many more people and many organizations of the problems involved in the use and misuse, and in the proper management of soil, water, forests, grasslands, minerals, wildlife.

THE WORLD OF THE FOREST. Clepper, Henry and Arthur B. Meyer. 122 pages, illustrated, indexed. D. C. Heath & Co., Boston, Mass. 1965. $1.32.

In readable text, the authors present the forest resources of the world and their significant role in the biological, economic, and social welfare, stressing the importance of forests to conservation of water and wildlife.

Prepared in cooperation with the Society of American Foresters—and one of the Science Resource Series—the final chapter is devoted to "The Profession of Forestry."

MANUAL OF FIELD BIOLOGY AND ECOLOGY. Benton, Allen H., and William E. Werner, Jr. 230 pages. Burgess Publishing Company, Minneapolis, Minn. 1965. Paper $3.25.

In the fourth edition of this workbook, designed to accompany *Field Biology and Ecology* by the same authors, major changes occur in the section on biological literature. This has been extended and updated. (Earlier editions appeared in 1956, 1957, and 1961.)

NEWS AND NOTES (Continued from page 157)

K., Bióls. Francisco González Medrano, Dr. Arturo Gómez Pompa, Ing. Efraím Hernández X. and Dr. Jerzy Rzedowski.

Further information may be obtained by writing: III Congreso Mexicano de Botánica, Secretario, Bióls. José Sarukhán K., Apartado Postal 19140, México 19, D. F., México.

Natural Chemical Speeds Up Leaf Drop and Aging of Plants. A natural chemical in plants which makes them "grow old" faster has been isolated and structurally identified, thereby opening the door to many practical applications in agriculture.

This hormone-like chemical promotes the dropping of leaves, flowers, and fruits in a process called abscission. Because of this role, the chemical has been named abscisin II by scientists of the Agricultural Research Service of the United States Department of Agriculture and the University of California.

Three major groups of plant hormones are now recognized: auxins, gibberellins, and kinins. Auxins kill weeds and promote rooting of cuttings, gibberellins accelerate growth and flowering of trees and shrubs, and kinins keep vegetables fresh on the way to market.

An arrangement of yellow and gold varieties of annuals including bartonia, lupine, gazania, aster, carnation, California poppy, zinnia, and others, entitled a "Bouquet of Sunshine."

Synthetic abscisins might be used to defoliate plants at all stages of growth and in any weather, thin fruit at blossom stage, and eliminate after-harvest growth of such perennial crops as cotton. They also might be used to block flowering in some plants and make buds stay dormant to escape winter damage.

Dr. Frederick T. Addicott, plant physiologist at the California Agricultural Experiment Station, and Dr. Orrin E. Smith, ARS plant pathologist, led the abscisin II research. They were assisted by Dr. Kazuhiko Ohkuma and Dr. William E. Thiessen, organic chemists of the California Station.

Several scientists have studied abscission-accelerating chemicals since Daphne J. Osborne, as English plant physiologist, obtained evidence about ten years ago that such substances occur in plants.

Fragrance in Modern Roses. Modern roses are as fragrant as old-fashioned roses, frequently surpassing them as garden perfumeries. Thus, Dr. Walter E. Lammerts summarizes his recently completed study of this rather controversial subject. His research indicates that in the "Gay 90's" era, fifty per cent of the garden roses were fragrant, compared with fifty-six per cent of the modern roses, giving the latter group a slight edge.

'Chrysler Imperial'.

Dr. Lammerts rates the fragrance of 'Fragrance', a 1964 introduction, as more pronounced than that of 'Chrysler Imperial', introduced nine years earlier and winner of the American Rose Society Award for fragrance, based on five years of testing. And Dr. Lammerts considers both 'Fragrance' and 'Chrysler' superior in fragrance to 'Marshall P. Wilder', one of the most fragrant of the old-fashioned roses.

He is opposed to isolating a single factor, such as fragrance, as a basis for evaluating roses of different periods. Dr.

'American Heritage'.
a 1966 All-America Award winner.

Lammerts feels this tends to overlook improvements in bud form, profusion of bloom, resistance to disease, color, texture, lasting quality, vigor and length of flowering season.

A case in point is 'Charlotte Armstrong', which represents a major breakthrough in modern rose hybridizing. The superb bud form, long and pointed, of this rose was a heritable trait and appears consistently in its offspring. By comparison, the buds on roses of the early 1900's seem awkward and clumsy.

'Queen Elizabeth' is ideal for those who wish to capture an outdoors or woodslike fragrance inside their homes. This is the original grandiflora rose.

The perfume of 'Fragrance' is reminiscent of the old-fashioned varieties: 'Chrysler Imperial' carries a rose-clove flavor; 'Mister Lincoln' combines the fragrance of tea and damask roses; 'Camelot, is spicy; 'Tiffany', lemony; 'Granada', spicy-tea; and 'Polynesian Sunset', fruity. 'Junior Miss' has fragrance like that of a tea rose.

Other roses with distinctive fragrances include 'Angel Wings', apple scent; 'Mirandy', rose-lemon; 'Golden Showers', orris; 'Sutter's Gold', quince; and 'Charlotte Armstong', lemon-nasturtium.

The 1966 American Rose Annual, published by the American Rose Society, covers a wide variety of subjects, valuable to the novice rose grower or the more advanced grower interested in improving his skills. Information on rose culture and on the proper selection and use of pesticides and equipment is invaluable to all gardeners.

The "Proof of the Pudding" furnishes candid editorial evaluation and numerical rating of the newer roses based on actual experiences of amateur rose growers in all sections of the United States.

Available only from the American Rose Society, 4048 Roselea Place, Columbus, Ohio 43214, the 250-page, hard-bound *American Rose Annual* may be purchased for $5.00 or received free with membership ($6.50) in the American Rose Society.

The Brooklyn Botanic Garden has reproduced a carefully chosen selection of over eighty photographs in its latest handbook, *Creative Ideas in Garden Design,* representing the work of such landscape architects and designers as Thomas D. Church, Innocenti & Webel, Edward D. Stone, Jr., Mrs. H. I. Nicholas, Arthur Edwin Bye, Jr., and Mary Deputy Cattell.

The photographs, which make up most of this sixty-four-page book, are grouped according to the purpose of the planting. The first section illustrates "Gardens to Live In," the second "Gardens for Viewing," and the third "Pattern and Texture."

Included in this handbook are popular definitions of landscape terms and points to keep in mind in home landscaping; also a list of books on garden design.

Creative Ideas in Garden Design may be obtained by mail from the Brooklyn Botanic Garden, 1000 Washington Avenue, Brooklyn, New York 11225. The price per copy postpaid is $1.00.

A Limited Edition of two hundred and fifty copies, hand-bound, of *A Delectable Garden* by Bernard Palissy (1563) was made by The Herb Grower Press (1965) at the suggestion and with the aid of Helen M. Fox. Mrs. Fox translated this book, which appeared originally as part of *Recept Veritable,* from the French and also wrote the introduction.

A Delectable Garden is $7.00 a copy.

This year the Herb Grower Press reprinted, in a limited edition of two hundred and fifty copies, *The English Vineyard Vindicated* by John Rose with a preface by John Evelyn and a bibliographic appendix by Robert H. Jeffers. Handbound in beige leatherette, the price of this little-known book is $5.00.

Philip W. Foster of The Herb Grower Press has devised special lithographic equipment by which he photographs the pages of old works without taking the book apart. He makes his own plates and prints in his shop in Falls Village, Connecticut. The hand-binding is done in Hartford by the same firm that bound some of Mark Twain's books when he lived there.

LETTERS TO THE EDITOR

Seeing the photographs of *Mitella nuda* and *Tiarella cordifolia* in the May-June issue of *The Garden Journal* reminded me of a facet of their natural history that may brighten the day for those who visit the Garden in wet weather and when the plants are going to seed.

Each genus has developed a mechanism for local seed dispersal powered by the kinetic energy of falling water drops. In *Mitella* the mature capsule is an erect, open cup with lips flaring at 45°; it functions as a splash cup when a water drop falling from the forest canopy lands in it

and the splash carries the seeds upward and outward from the brim for several feet. In *Tiarella* the mature capsules are horizontal, with a short upper valve and a long, protruding lower one. When a falling drop strikes the tip of the lower valve, the valve is depressed and a seed rolls out to its tip and is thrown upward and outward as the valve springs back.

The capsule structure is the main distinction between these closely related genera. We may speculate that two populations of their immediate ancestor entered separate forested regions and each developed a different way of using water drops to scatter its seeds.

D. B. O. Savile
Principal Mycologist
Plant Research Institute
Canada Dept. of Agriculture
Ottawa, Ontario

In my observations on *Talauma mexicana* (*The Garden Journal,* March-April, 1966) I did not mention trees growing within the town of Ocozocoautla, considering this as part of the original habitat. In the casa of "Las Niñas Moya," near the center of Ocozocoautla, there are seven talaumas; these are closely and irregularly spaced, and one might imagine the casa as having been built around a segment of rain forest. One of the seven trees bears flowers which are larger, and their petals much wider than those of the other six. I believe this is only partly due to the younger and more vigorous condition of the tree. Incidentally, the tree in Ocozocoautla mentioned by Professor McDaniels, in his letter to the Editor in the July-August, 1965, issue, was felled for civic improvements.

In turning to *Magnolia sharpii* (Mir.) permit me first to pay homage to the late Dr. Faustino Miranda. I have great respect for him as a botanist, but what I really value is my remembrance of him as a friend. D. Miranda knew *M. sharpii* in the vicinities of Tenejapa and Pueblo Nuevo Solistahuacán, and I in a patch of cloud forest of S. Juan Chamula. Neither of us secured flowers from these habitats. I believe the type was a tree growing in a small house-patio in San Cristobal Las Casas—this, too, has since disappeared to make way for urban progress. A seedling (from the type tree?—I am not sure) is now some five feet high and growing on the grounds of the Hotel Oaxaca Courts in Oaxaca, Oax.

T. MacDougall
Tehuantepec
Oax., Mexico

These short notes on growing *Torreya taxifolia* from cuttings may interest some readers of *The Garden Journal.*

After reading the description of *Torreya taxifolia* I decided I had to see it, so my sister and I drove to the little town of Appalachicola, Florida. There we got directions for locating the small Torreya Park, in which the trees were growing in deep sand on the hillsides. The largest

Caroline Dorman, photographed in her garden several years ago with *Torreya taxifolia*. The tree has grown another two feet since then.

were perhaps forty feet in height, and there were few young plants.

Of course, I did not touch the trees in the park, but on inquiring in the town, I located a farmer who had a few trees. He gave me permission to take as many cuttings as I wanted. I was supplied with a florist's box and plenty of moist sphagnum moss, and packed the cuttings carefully. It was four days before they were planted, but a number of the cuttings rooted.

I had already prepared a canvas-covered bed under the shade of tall trees. (It had been dug out and filled with six inches of coarse sand.) Short cuttings were inserted and kept well watered. In three months they formed roots, but transplanting was difficult, the roots being as brittle as icicles and breaking as easily. Usually there was only one root, going straight down, or growing at right angles to the stem. Today, years later, I have just three torreyas. Growth is very slow, and the largest is only about six feet in height. It is a beautiful, shapely, little tree. The soil here is sandy and acid, for I live in the pine-clad sand hills of northwestern Louisiana.

The late Dr. J. K. Small, who was Chief Research Associate and Curator at The New York Botanical Garden at the time of his retirement, described a related species, *Taxus floridana,* as occurring in the same locality, but I did not find it.

When I visited Torreya Park, it was not protected, and I saw a woman trying to dig up a specimen of *T. taxifolia* two feet tall. Persons with whom I talked said that no one had succeeded in growing it.

Caroline Dorman
Salina, Louisiana

Readers of *The Garden Journal* may be interested to learn that seeds of *Magnolia sharpii* (see letter from Joseph C. McDaniel in the March-April, 1966, issue) which were sent by Thomas MacDougall to Paul J. Bowman of Fort Bragg, North Carolina, have germinated. This magnolia was named in honor of Dr. A. J. Sharp, former head of the Department of Botany of the University of Tennessee, by the late Dr. Faustino Miranda of Mexico.

Arboretum Society Bulletin
University of Tennessee

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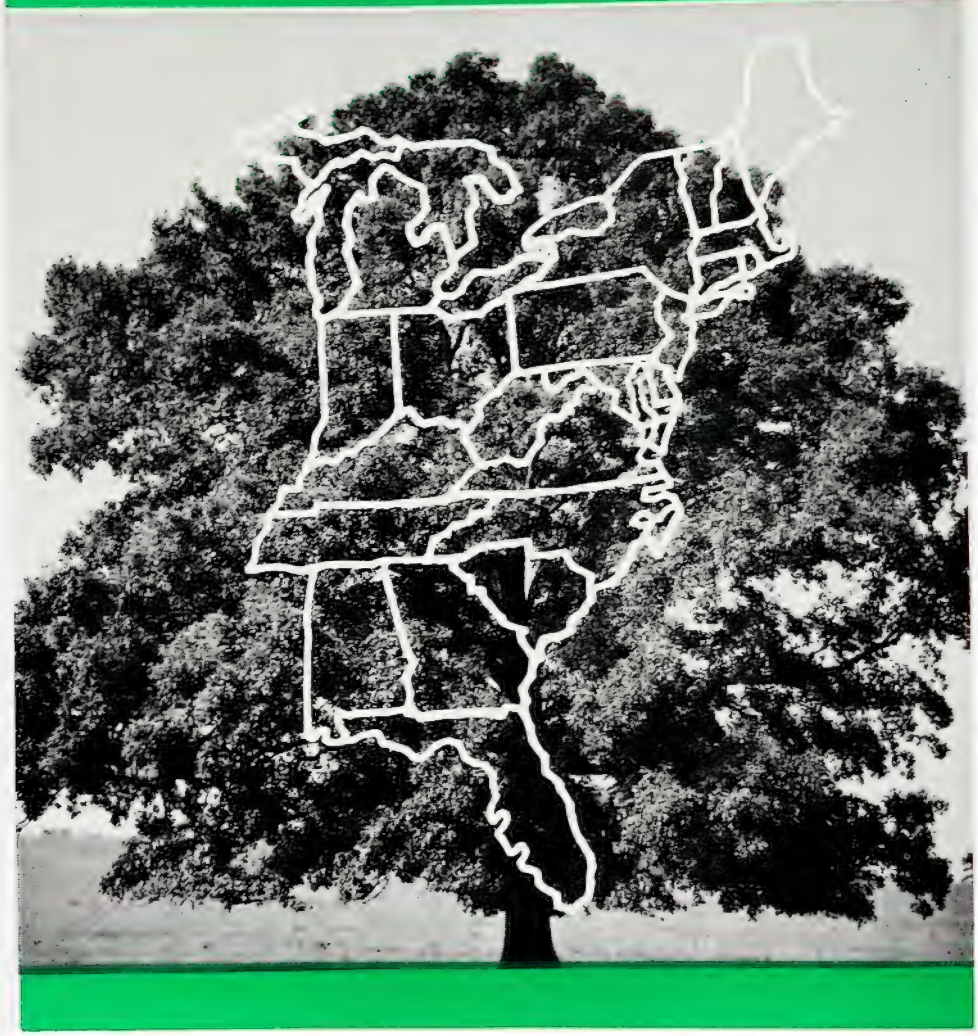

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THE GARDEN JOURNAL

THE NEW YORK BOTANICAL GARDEN

Volume 16, No. 5 September-October, 1966

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THE GARDEN JOURNAL

DOROTHY EBEL HANSELL, *Editor*

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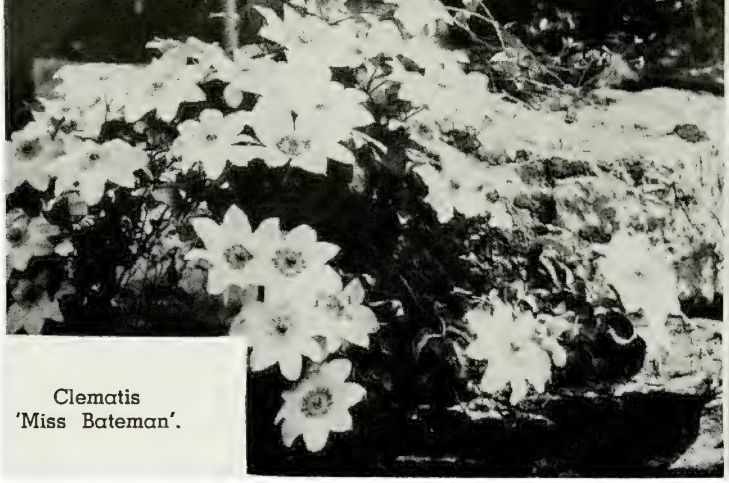
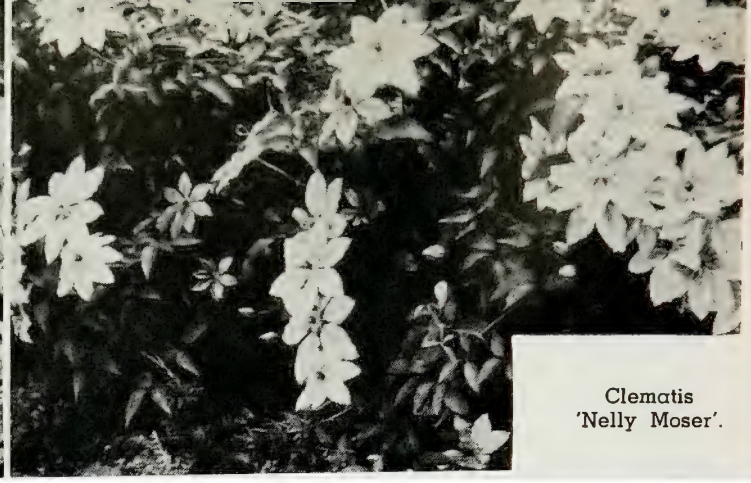


Clematis 'Miss Bateman'.



Clematis 'Nelly Moser'.

ON CLEMATIS

By HENRIETTA E. S. LOCKWOOD

Mrs. (John E.) Lockwood is a member of the Board of Managers of The New York Botanical Garden and a member of the Garden's Women's Council.

"Because it climbs on lattice,
The rabble says cle-mat-is,
But Webster will not cease to hiss,
Until they call it clem-a-tis."

SO WROTE COL. J. E. SPINGARN, member, until his death in 1939, of the Board of Managers of The New York Botanical Garden. Col. Spingarn, by his lectures, writing, and research, did more than any other person to popularize the growing of clematis in America.

European and English gardens abound with clematis, city as well as country. On a spring day, driving past the dingy row houses of suburban London, so many doorways are wreathed with *C. montana rubens,* they too are almost tiresome by their sameness. As one passes on into the country, montanas clothe the cottages, sometimes ascending the roofs and often climbing to the tops of trees.

In America, however, if someone spies the lovely cruciform blossoms of the soft pink climber, he gasps, "What *is* it?," half as much from surprise as from wonder at its beauty.

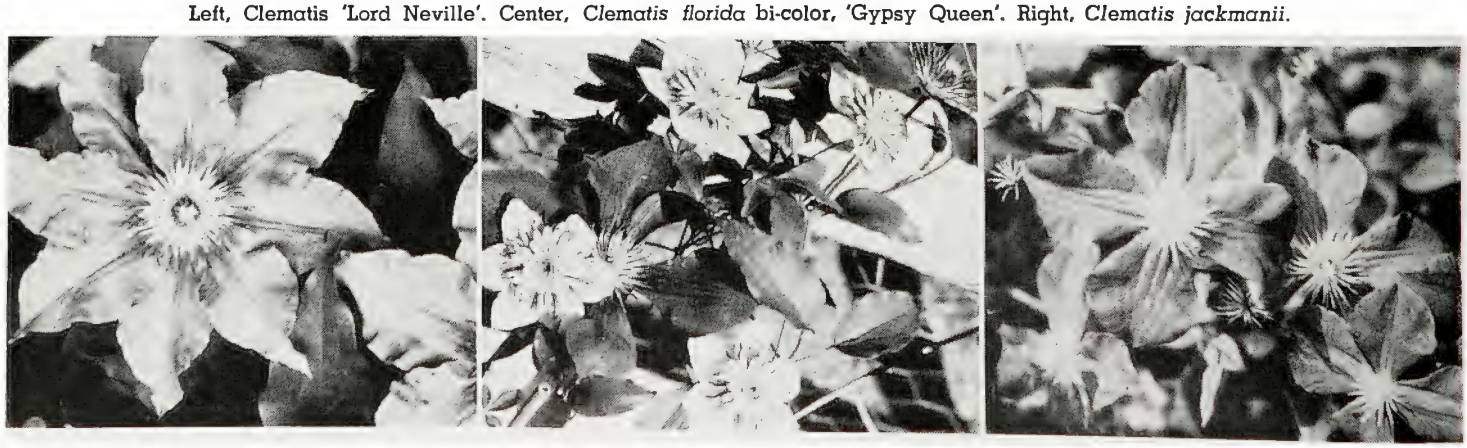
Yet our most famous plant explorer, Ernest H. Wilson, wrote, "I count *C. montana rubens* among the finest climbing plants it has been my privilege to add to American gardens."

Compared with other garden flowers, not many books have been published on the genus *Clematis* of the *Ranunculacae,* and of the half dozen in the English language, all have been written by Englishmen. However, in Ernest Markham's classic *Clematis,* first published in 1935 and reprinted many times, there is a chapter on "Clematis in America" by Col. Spingarn.

All too few nurseries in this country carry many clematis, either cultivars or species. This may be due in part to the general dearth of unusual plants. The keynote of the address of Henry H. Hohman, dean of American nurserymen, receiving the Medal of Honor from the Garden Club of America last spring, was an impassioned plea to young growers to raise rare plants.

Difficulty in obtaining unusual plants is the greatest lament of amateur gardeners like myself who scour the catalogues, try to initiate offers of cuttings, and import from abroad. Seeds are a partial answer; but although the species come true from seed, some supposedly species clematis are in reality hybrids. This accounts for some of the different forms of certain plants, as, for example, *C. montana;* and to add to the confusion, there

Left, Clematis 'Lord Neville'. Center, *Clematis florida* bi-color, 'Gypsy Queen'. Right, *Clematis jackmanii.*



Clematis 'Huldine' and 'Mme. Edouard André' grow luxuriantly on wall. Close-up of flower of 'Huldine' at left.

are several cultivars of *C. montana*. Finally, to complete the gardener's despair, clematis on both sides of the Atlantic are sold wrongly labeled for various reasons.

It was somewhat over a hundred years ago that the great explosion of clematis hybridization took place. Robert Fortune kindled the fire by his introduction from China in 1850 of *C. lanuginosa,* the largest of any species. This led to crosses with *C. viticella*, native of southern Europe, and *C. florida* (the tessen of Japanese painting) which had already been brought from Japan by Thunberg. America was more clematis conscious in those days and if England produced, America introduced, for *C. florida* was exhibited on this side of the Atlantic in 1836. *C. patens* was brought from Japan by Siebold in 1836 and exhibited in Boston three years later. The extremely popular hybrid *C. jackmanii* was first exhibited in England in 1863 and shown in Boston, again three years later, by the historian Francis Parkman.

William Robinson, the great English gardener, called clematis "the loveliest of all our northern climbing plants." Seeing a well-established vine displaying several hundred flowers, it would be hard to disagree. The large-flowered hybrids are spectacular and the carefree species, with their billowy growth and myriad of small flowers, cannot fail to charm.

Clematis 'Ville de Lyon'.

The prevailing color of clematis is blue. Light to dark in many shades (and often a variety of hues on a single vine, for the bud opens a deep color, paling as it fades). There are also reds and purples and mauves and even glistening satiny white. In a race so saturated with blue it is not easy to breed pink, but there are several old and one new pink hybrid. Yellow is represented among the small-flowerd species by *C. tangutica* and *C. orientalis.*

Whether the individual flowers are tiny and starlike, as are those of *C. paniculata,* or an outrageously large, eight-inch, as that of 'Marcel Moser', invariably each is of fine form and grace.

There are early varieties, midseason and late varieties. A succession of bloom can be had from spring until fall and extended even later by using some of the more tender kinds in pots.

Growing clematis as a hobby, I have planted them in all kinds of ways. The following suggestions are merely the result of experiments in my garden about forty miles north of New York City. I find they thrive best if set in a rich, cool, sweet, but above all, well-drained soil. A planting hole might well be measured by one's strength. Approximately two-feet wide by two feet deep is worth while, even for a two-penny-looking plant, as there are records of clematis living for well over half a century. Although hundreds are grown for the cut-flower market in the acid peaty soil of Holland, they prefer some lime. A handful or two of bonemeal and a shovel of dehydrated manure provide food. Rubble and sand provide drainage. Compost adds quality to the soil. When all is blended and prepared, the roots are carefully spread out (unless a container-grown plant has been obtained).

The crown is set a couple of inches below the level of the soil which is then gently tamped down. A mulch keeps the roots cool. A further mulch in fall adds to the insulation. Each succeeding spring a handful of potash improves the color, and in the fall the same amount of bonemeal or superphosphate (well watered in) adds food.

Because of our hot summers I find plants require about one inch of water a week, which works out to four

Clematis 'Barbara Jackman'.

Clematis 'Hagley Hybrid'.

Clematis 'King George V'.

and a half gallons per square yard. Having become quite sensitive to the quantity of rain these last several summers, one soon learns how much water has to be added to that which nature furnishes.

In the New York area, spring rather than fall planting is often wisest, since the winters, with unpredictable freezing and thawing, are hard on young plants.

If there is danger of injury from animals, children, or lawn mowers, the base of the plant should be protected by a collar, by an inverted flower pot with the bottom knocked out, or by what you will. I use a small circle of wire mesh. It is hardly noticed.

Because clematis climb by twining leaf-stalks, a support must be provided at once. Spring growth is spectacularly rapid. I have watched a 'Huldine' grow six inches in twenty-four hours! The plants must be tied in frequently or have something to which to cling. It is natural for them to climb upwards. Anyone who has seen the high brick wall at Bagatelle planted with hundreds of different colored clematis growing skyward will never forget the sight.

In the wild, they are often found beside a shrub where the roots are shaded and they can ramble at will over the host. If such self-help in the garden is not allowed, they must be tied or they will become a tangled mass. In young plants the fast-growing tips must be pinched out to allow the roots to balance the top growth and to form a well-furnished base.

To prune or not to prune? Advice on pruning has been so often discussed that sometimes the gardener is thoroughly confused. North of New York City, however, the winter does much of the pruning. Therefore, in spring the dead wood is removed (starting at the top of the plant for many a live piece has been cut down in error). Beyond that a simple general rule is to hard prune the later-flowering varieties and leave the early ones alone. This is rough and ready advice. For more professional pruning it is essential to know the dominant ancestry of a hybrid. Some comments on pruning hybrids follow:

PATENS AND FLORIDA GROUPS: Flowering spring and early summer, they produce large flowers on last season's wood, sometimes smaller flowers on young wood in late summer. It is easy to distinguish *C. florida* because of two leaf bracts on the stem midway between the flower and the leaves. The varieties with double flowers belong to the *florida* group. Little pruning is necessary. Dead ends should be cut back to live buds in early spring. If desired, the flowering wood may be cut back after bloom, either to shape the plant or to encourage strong growth for the following year.

LANUGINOSA GROUP: Flowering early summer to late fall, this group produces very large blooms on the lateral shoots from old or ripened wood. Little pruning is necessary. To obtain early and extremely large flowers, thin out weak and dead wood in spring. If, however, a mass of smaller flowers in late summer is desired, prune hard in early spring.

JACKMANII AND VITICELLA GROUPS AND PANICULATA:

Left. *Clematis montana rubens* flowers freely against a wall. Right. Clematis 'Nelly Moser' is trained gracefully on a trellis.

Summer and autumn flowering, these produce masses of flowers of medium size and, in the case of *C. paniculata,* small flowers on the current season's growth. Hard pruning is necessary—cut down to two feet or even lower in early spring. Most species and small-flowered groups need little pruning except for shape.

Clematis are subject to few pests and diseases other than the "wilt." This sudden wilting of the plant or a portion of the plant is usually due to a fungus disease *(Ascochyta clematidina).* Sometimes, however, it comes from old woody stems too thick to let the water rise. Spraying the foliage and surrounding soil with a fungicide acts as a deterrent. Should wilt be observed, cut below the wilting point (and destroy the diseased piece), even if this is to the ground, and keep the plant well watered. A weak solution of a plant food often aids and new shoots will usually appear. Well-established plants are much less subject to attack. As summer passes, should the leaves turn spotted and brown, they may be removed. Browning does not seem to affect the health of the plant.

There are many ways of using clematis. Because the large-flowered hybrids take up little space, they may be planted to great effect on a small property. They are lovely grown in competition with climbing roses which supply support, while they in turn add color and surprise. They may be grown in tubs and used as accents —the Victorians loved them thus. There are quaint pictures in the old books of fabulous-looking specimens meticulously groomed. They are fascinating pegged down as a ground cover with every blossom turning skywards towards the light. They are effective grown on trellises, up walls, over doorways. The species with their cloud of growth, myriad of flowers, and fluffy seeds are admirably suited to soften the outlines of sheds and garages and disguise unsightly buildings. Species or hybrids may be used to edge property lines or decorate front fences welcoming the guest and also pleasing the passerby.

Gerarde, the famous old sixteenth-century herbalist, spoke of *C. vitalba,* native of the English hedgerows, as "decking and adorning waies and hedges when people travel." It was then as now called "Travelers Joy."

Wherever and however clematis are grown, they never fail to attract admiration and give delight.

A few of my own favorites are listed here in their approximate order of bloom:

Clematis alpina (Atragene alpina), "the Alpine Virgin's Bower"; soft blue, nodding, four-inch flower. Will bloom in shade.

Clematis montana and hybrids. Pink and white flowers. Will grow to great height and will bloom in shade.

'Miss Bateman' *(patens).* White flower with chocolate stamens.

'Lord Neville' *(lanuginosa).* Deep blue flower. The beautifully formed sepals have a wavy edge.

'Mrs. Cholmondeley' *(lanuginosa).* Enormous, flat, light blue flower; the most continuously floriferous of the large-flowered hybrids.

'Henryi' *(lawsoniana).* Large, white flowers with long, pointed sepals and a center of dark stamens.

'Hagley Hybrid' (Can be treated as either *lanuginosa* or *jackmanii*). A new hybrid, deep shell-pink flower with brown stamens. Vigorous and free-flowering.

'Prins Hendrik' *(lanuginosa).* Extremely large and ruffled flower. A shy bloomer.

'Huldine' *(viticella).* Cup-shaped, four-inch, pearly white flower. Strong-growing.

'Minuet' *(viticella).* Two-inch, creamy flower banded by purple.

Clematis florida bi-color (syn. *C. sieboldii*). The center is made up of a rosette of purple staminoides which persist after the sepals fall. Prune after blooming. Must be pot-grown since it cannot stand our cold.

'Lady Betty Balfour' *(viticella).* Deep, rich purple flower with yellow stamens. The last to come into bloom in my garden.

Clematis cirrhosa. White, bell-shaped flower and fern-like foliage. Winter blooming. Must be pot-grown since it cannot stand our cold.

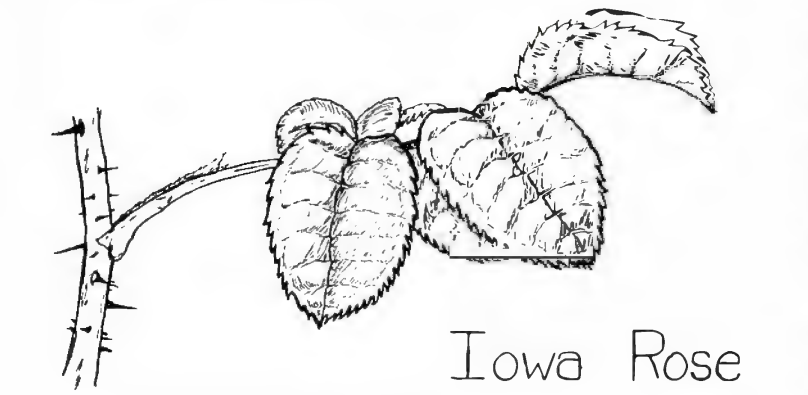
HAD ROOTS: DID TRAVEL

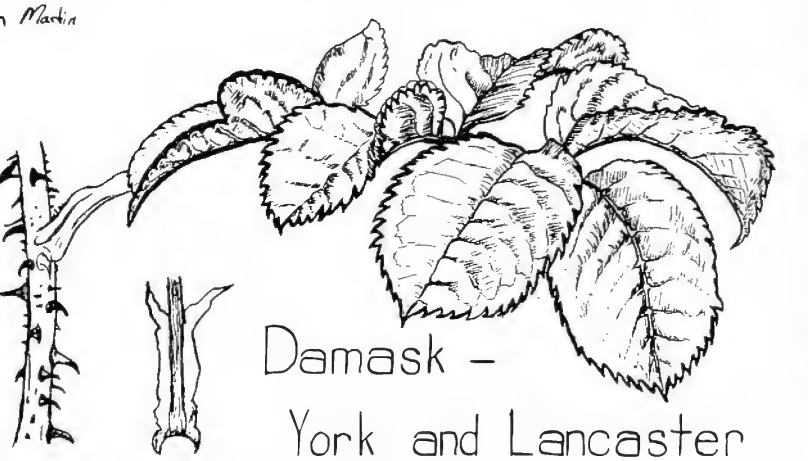
By MAUDE GAY BENZINGER

Mrs. (A. Thomas) Benzinger of Sparks, Maryland, has a real interest in old roses and has spent considerable time and effort in studying them. She is a member of the American Rose Society.

The author acknowledges the assistance of "Polly," Mrs. Robert Sharp, who furnished the rose from Iowa; Mrs. Edith Gray Pierce who sent roots and seeds from another section of Iowa for comparison; Peter Semeniuk of the Ornamentals Division, United States Department of Agriculture at Beltsville, Maryland, who raised roots of Mrs. Sharp's rose and one hundred seedlings of Mrs. Pierce's rose for comparison and who checked the manuscript; Mrs. Florence MacMurray Law of Ireland; and the botanical student, Susan Martin, who made the drawings to illustrate the manuscript.

THIS TITLE could head the story of many an old rose. It applies here to a long-cherished one now in my Maryland garden. When Polly gave it to me, she traced its history from Kentucky years before to Indiana and then by covered wagon to Iowa with her great-grandmother in 1850. Since it did not set seed readily but sent out roots in every direction, it had always been propagated vegetatively and so retained its identity no matter where and when it went with the succeeding





generations of this pioneering family.

What was its name? It was simply Grandmother Walker's rose to her descendants. Polly's family was of British descent, so we thought it might have come to America with an earlier ancestor in Colonial times and thus would be easy to find in an English book of the 1600's. A start was made by reading Sir Francis Bacon's delightful essay on gardening. He gives a detailed list of plant material for every month of the year, with great stress laid on fragrance. Strange to say, he mentions only four varieties of roses: the Eglantine with its apple-scented foliage; the musk rose, "which perfumed the whole garden when it bloomed after all others were gone"; and "Roses damask and red, fast flowers of their smells, so that you may walk through a whole row of them, and find nothing of their sweetness, yea though it be in a morning's dew."

Bacon seemed to make a distinction between damask and red roses. Polly had said that her rose was red. There were few red roses in that period. Could hers be that one of many travels, the one called the "red rose of Lancaster?" Since roses would not be in bloom for months to come, it seemed wise to order some old damasks and gallicas to use for checking in the spring.

They came, all six of them, in the middle of an early snowstorm. That would not have been too bad, except that we were away on vacation. On our return, those big husky plants were stored in the coldest part of our nice warm cellar. In less than a week they began to leaf out. No pots large enough to contain them were available, but a kind-hearted baker provided lard cans. Holes were punched for drainage, soil dug and thawed, and the roses brought into the house for the winter. Fortunately one room had windows almost down to the flagstone floor—these had been installed during my orchid-raising era. The roses and I shared this room for many months so that I got to know intimately every thorn and prickle, to say nothing of the leaves and a few blooms. It was not long before I realized that the leaves of Grandma Walker's rose resembled those of the damask more than they did those of *Rosa gallica officinalis* and its sport 'Rosamundi' *(R. gallica versicolor)*.

For some reason or other, spring came unusually late that year. In the meantime I read everything at hand on the subject of old roses and had long talks with gardening friends. "Old soldiers never die," so they say. That may be open to question, but it is true that old gardeners never forget the flowers of their childhood. One elderly neighbor remembers hers vividly. This is her story:

"Father was born in 1850. He was a great lover of roses. After his marriage, he went to his grandmother's home in the north of Ireland to get her treasured roses for his bride. The place had been farmed by his family for over two hundred years (Bacon's own century, the 1600's). The roses had come from the old castle garden of their landlord, the Marquis of Northborough. Under the dining room window, father planted the fragrant musk rose, which bloomed late. We had the Eglantine, the red rose of Lancaster, and several others."

As soon as my rose from Iowa bloomed, I took several sprays to my Irish friend. She was certain that it was identical with the Lancaster rose of her childhood. The tight, round buds and the full, crimson blooms, like plump cushions set with rows of golden pins around each center, were exactly like the ones they had called the red rose of Lancaster. Even the habit of spreading roots reminded her that their gardener had only to strike his spade down sharply and dig up new plants when they were needed to lengthen their long rose hedge from time to time. Polly had told me earlier of the long row of these roses beside the farm drive, planted in just this way during her grandmother's lifetime.

Unfortunately my elderly friend's positive identification of this rose added to the confusion instead of clearing it up. The purchased Lancaster rose, *R. gallica officinalis,* rose of Provins, to give it a few of its present names, soon came into bloom. It was a semidouble, identical with the description in G. S. Thomas's book of old shrub roses.

Now the search to identify Polly's rose and the one from the castle garden of Ireland really began in earnest. There were visits to museums and art galleries, consultations with botanists and taxonomists, coast-to-coast correspondence, and exchange of specimens. This was really doing things the hard way. Often frustrating, nev-

ertheless it proved to be a fascinating experience for the gardener now turned detective.

Finally there were results. In a German folio of 1747 I found pictures of four stiff-looking roses. One of these was *"Rosa rubra flora plena."* It was full and it was red and it appeared to be Grandma Walker's rose, but it was also called rose of Milesii, and it certainly was not the one of twelve petals described by Pliny and now called the rose of Provins.

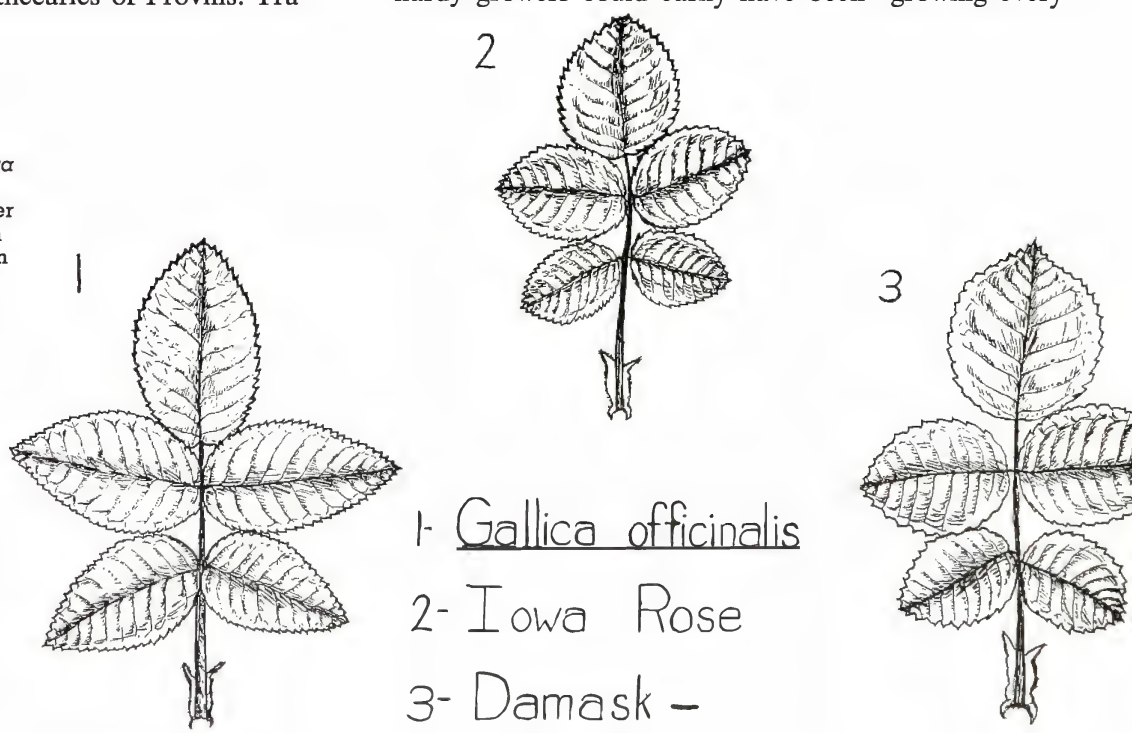
Soon afterwards, there was another red-letter day. A battered copy of Gerard's Greate Herballe was brought up from the locked vault two floors below the main reference room of a city library. This much-quoted gardener, apothecary, and herbalist was an avid collector of the botanical knowledge of his times. Among his pictured roses, one looked like Polly's rose. To be sure, the picture was crude, about as much like a pressed formal dahlia as a rose, but the description fitted, "Rosa rubra, rose of Provins, common red rose of England. The red rose groweth low in respect to the former (the white rose). Its stalks are shorter, smoother, and browner in color. The leaves are like, yet of a worse dustie colour. The flowers grow on the tips of the branches, consisting of many leaves of a perfect red color."

Although Gerard called it the rose of Provins, again the pictured rose was a full one, and not that of twelve petals. So the search went on. At last, Parkinson's account in 1629 gave something tangible on which to work. He describes "Rosa anglica rubra, the English rose, which abideth low and shooteth forth many branches from the rootes, with a greene barke thinner set with prickles and flowers of red or deepe crimson colour with many yellow threds in the middle; the scent is not comparable to the damask rose, yet this rose when well dryed and kept, will hold both colour and scent longer than the damask, be it ever so well kept."

Again and again in my research I found this reference to the peculiar chemical property of gallica roses. They not only retain fragrance when dried, but desiccation deepens the color and the scent is stronger than when the blooms are fresh. This was the secret of the commercial dried rose petals and the famous conserves made for many centuries by the apothecaries of Provins. Tradition says that the original variety had been brought back from the Crusades by Thibault of Champagne. It was this rose that the second son of Henry III of England introduced to his country and that was made the emblem of the House of Lancaster. For three hundred years this rose was often called the red damask because of the association with the Holy Land and Damascus. These red roses of France are now known as gallicas from the ancient name of Gallia applied to that land by Caesar. This led to confusion among some modern writers as to which was the apothecaries' rose: the one called gallica or the one we call the damask, which was commonly grown in the south of France. Apparently nobody had made the simple experiment needed to settle the question.

The petals of six fragrant rose varieties were carefully dried in my kitchen and stored for several weeks. These included damasks and gallicas. All faded and lost scent except the latter which acted just as they were supposed to do. *"Probatum est,"* as Pliny would have said. It has been proved! There were enough petals of the Iowa rose to finish the experiments. Pouring hot syrup over these gave a product of such rich color, strong fragrance, and rose flavor that half a cup made three glasses of red rose jelly—with pectin added and more water and sugar. The hot syrup toughened the rose petals, making them undesirable for use in conserves. This was probably why the merchants of Provins used their petals in dried and powdered form. Steeping in warm water might be an alternative for this procedure.

Polly's rose was definitely a member of the gallica group, but which one? Its lax growth, the shape and color of its leaflets, its many petals with the outer one reflexed, all suggest a cross between gallica and damask. The latter is now considered to be *R. rubra* × *phoenicia*. Crossing back on a gallica could give just the right combination of genes to provide exactly the rose best suited to the needs of apothecary and housewife. The gallica habit of spreading roots would have made propagation simple and rapid, for Polly's original root gave her 117 more plants in a very few years. Such strong, hardy growers could easily have been "growing every-



Drawn from leaves of plants of *Rosa gallica officinalis,* the Iowa rose, and the damask—York and Lancaster rose. Leaves with five leaflets each were chosen for uniformity, although some of the damask roses and occasionally the gallicas in the author's garden have leaves with both five and seven leaflets; the leaves of the Iowa rose have only five leaflets.

Rosa gallica officinalis and the damask—York and Lancaster rose on the opposite page were drawn from Bunyard's *Old Garden Roses* (1936); the Iowa rose from a plant in the author's garden.

where," as Gerard said in 1597. His statement has been taken to refer to the rose of twelve petals, but there may be some doubt on that point.

Both Gerard and Parkinson classify their red roses as the red rose of England. Since Gerard adds rose of Provins, he apparently groups all red roses of his acquaintance under the one heading. In his text he mentions the one from Provins as best according to color and adds "our worst one" and a large one in his London garden. Thirty years or so later the more precise Parkinson calls his red rose only "Anglica rubra or the English red rose."

In general their descriptions apply to either the rose of twelve petals or to the full one. With the former in mind, modern authors tend to discredit the illustrations of Gerard, which were probably taken from an earlier volume and do not apply to the rose of Pliny and Thibault. If the herbalists did consider the full rose as the common red rose, the descriptions are more apt in certain instances. The dusty color of the leaves, for example, applies to the hybrid but not to the clear green of the early gallica. Parkinson's "red or deepe crimson" for the blooms is an excellent description of the full rose, but does not apply to the other which is a bright rose-pink, the "rose vif" of the French.

Let us take the words and pictures of the early English herbalists at face value for a moment. If they actually did have the rose of many petals in mind, then this full rose was common in England one hundred and fifty years before the *Rosa rubra flora plena* of the German folio. As with the single and double forms of the cinnamon rose *(R. cinnamomea),* it was inevitable that more than one form would originate sooner or later in various parts of Europe. Search through old French books found no reference to a double form until Filassier wrote in 1795 about "The rose of Provins which has two forms, the one called 'chou' because of its petals taking that form, and the other one with very numerous flowers, but smaller."

"Cabbage" seems a bit far fetched for the slightly incurved petals of Thibault's rose, until we realize that the cabbage of 1795 was not the tight, round head of today. The only other very old gallica that we know is the one of five petals which the eleventh-century Moors called the "rose of the Magi." Since "cabbage" does not suit that one at all, I shall take it for granted that Filassier includes the rose of twelve petals for one of the roses he describes.

France in the Middle Ages was divided into many small kingdoms with little exchange of goods. This was the age of the rose as a useful herb and not as an ornamental. In the vicinity of Provins, the red roses were adequate for the conserves and dried petals sold by the merchants there. The damask of the Mediterranean district served well for the extraction of the rose water needed for medicinal purposes and the cuisine. There was little opportunity for varieties in rose-growing communities so far distant from each other to have produced early crosses. In fact, according to the historians, it was Renée the Good who is reputed to have been the first to import the gallicas from Provins into his southern domain and to have had both red and damask roses in a French garden.

In England conditions were very different. After the Norman conquest, the French orders established many religious houses there. Each of these was required to have an herb garden and at least one member who knew how to grow plants and how to prepare them for use. Roses were a requisite from the earliest times. There are twelfth-century letters in existence which include requests for more roses to be sent from France. Since the rose water of the homeland was derived from the damask rose, it seems likely that this would have been the variety desired. In the mid-1300's, on the other hand, one monk wrote that the red rose was the badge of England "ever since ye minde of man hath knowne." So it is more than a mere possibility that both red and damask roses grew side by side in many a secluded garden tended by monk or nun. Seeds dropped by birds could have resulted in the valuable hybrids which finally took over the uses of the earlier apothecaries' rose and even its names after a time. In checking through old books I found that Miller, Thory, and others mention that these crosses between damask and gallica have made classification extremely difficult. In the early 1800's there was still confusion in rose names. The folio #1 of Redoute's prints gives the Rose de Provins ordinaire, *Rosa gallica officinalis*. This one is not Pliny's rose of twelve petals but has about twice the number. Like the old algebra problems, we can continue by saying that it has half the number of the rose from Iowa. E. A. Bunyard wrote that the term "apothecaries' rose" was probably used for any of the old gallicas. Apparently it is safe to say that its various other names were not restricted to the rose which botanists now consider to have been the rose of Thibault and Edmond Crouchback, first Earl of Lancaster.

Before Linnaeus, there was little or no interest in plant names. After all, when kings were Louis the Fat and William the Red, who would be concerned with the exact name of a rose in the kitchen garden? Its utilitarian value was important, and only that! "A rose is a rose is a rose."

Times change; succeeding generations have new and different values. The red gallicas and the damasks were supreme in the centuries when they were essential to the daily lives of the people as an important ingredient of their medicines and food. No longer in use as herbs, these roses gave way to the newer varieties grown solely for beauty and are rare, indeed, in the gardens of the present time.

Unfortunately, I am unable to set down definite conclusions after months of intensive research. Old records are few, the information vague and difficult of interpretation. These bits and pieces gathered from the old volumes, interesting as they are, can only serve as a basis for conjectures as to what might have happened. More of the origin and early history of Grandmother Walker's rose may never be known. Even the suggested name, "common red rose of England," is open to controversy. On two counts, however, I can be absolutely certain: those red roses had roots and they did travel!

PACKAGED SUNSHINE

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continued from July-August, 1966

AVAILABLE LAMPS FOR GROWING PLANTS

BY NOW it is obvious that no single type of available lamp is even a close approximation of a perfect source of light for plant growth. Whether a more adequate single light source can be developed depends on the physical chemistry of artificial light design and on the desire of manufacturers to put the time and money into a search. At this time it is necessary to compromise and to use what is at hand. Such compromises are made more difficult by our ignorance of the radiation requirements of all sorts of plants and by the variations in what the individual expects to see in the plants which are being grown in the home.

Because of their low cost, high efficiency, and ready availability, two sources of artificial light are almost exclusively used in gardening practice. The fluorescent lamp and the incandescent lamp come in a bewildering array of sizes, shapes, voltages, wattages, service ratings, temperature characteristics, and so on. For our own purposes, this can be drastically simplified. We shall consider all incandescent lamps to be the same except for their intensity, and restrict the discussion to only two of the many types of fluorescent lamps. One of these is the standard Cool White lamp which is the same no matter who makes it. The other is the plant-growth lamps made by Sylvania (Gro-Lux) or by Westinghouse (Plant-Gro). These, too, are essentially identical.

Lighting engineers have worked out a standard method of determining the quality of the light emitted by lamps which they call the Spectral Energy Distribution, abbreviated SED. In Figure 5 (page 125, July-August issue) are SED curves which show what wavelengths are given off by the lamps. You can see that the three types emit very different proportions of the different colors of light—so different, in fact, that scientists have almost stopped talking about white light. Even the sun does not radiate evenly throughout the visible portion of the spectrum.

Before discussing any of the lighting units, a short review of the lamps themselves would be useful. Fluorescent lamps are rated in watts and, with few exceptions, the length of the tube determines the wattage. The lamp holders will extend the total length of the fixture about one to two inches beyond the actual length of the tube. Incandescent lamps, too, are rated in watts, but the size of the lamp (usually pear-shaped) may not reflect the wattage, since modern techniques have permitted the use of smaller lamps. The sockets for incandescent lamps are usually of the screw-type with the most frequently used sizes being either the medium base or the somewhat larger mogel base sockets. In any installation in which incandescent lamps are used, it is strongly recommended that porcelain sockets and heavy duty wire be used exclusively as a safety factor.

INCANDESCENT LAMPS

Two recent developments in incandescent lighting will have considerable impact on plant-growth installations. The more conventional incandescent lamps are now available in standard, rough service, and extended life styles. The rough service styles have more rugged filaments and are intended for installation where vibration or shock is a problem; this is not likely to be the case in plant-growing situations. The extended service lamps are, however, of some interest. These normally operate at high efficiency on electric current higher than that usual for homes or apartments (135 volts). Hence, they burn somewhat cooler at household current voltages (110 volts) and last correspondingly longer. Of course, they are more expensive, but the initial outlay is more than compensated by the extra life. As a consequence of cooler burning, there is slightly less visible light output, so a 25 W standard lamp will give about as much light as a 30 W extended life lamp.

The second development is the Iodine-Quartz lamp. These are incandescent lamps with iodine vapor in the lamp which prolongs filament life. They are expensive but emit more light and last longer than even extended life lamps. They are available now in rated wattages above 250 W, values which limit their use to either experimental installations or to installations such as shown in Figure 6 in which provisions are made to keep them far enough away from the plants to avoid excessive heating of the plants.

FLUORESCENT LAMPS

Fluorescent lamps have several characteristics which should be mentioned. The light output is not uniform throughout the length of the tube, and the two to four inches at each end emit considerably less light than does the rest of the tube. Thus, for installations using banks of fluorescent lamps, those plants which do better with lower light intensities should be placed under the ends of the lamps. A second characteristic of fluorescent lamps is the almost imperceptible but steady reduction in light output with time. Although the total lamp life is reasonably high, it is a good idea to figure on changing the complete set of fluorescent lamps at eight- to ten-month intervals—when the lamps have become sixty per cent as efficient as when they were new.

In addition to the familiar straight-tube, standard Cool White fluorescent lamps, there are a few newer types which, although Cool White in radiance, are higher in output. For increased efficiency, these may be grooved (Power Groove of General Electric Co.) or twisted (Powertwist of Duro Co.), or they may show no shape differences. The latter are called either High Output or Very High Output lamps and emit considerable more

Figure 6. An exposed-wiring light system as used in research.

light energy. The HO or VHO lamps are rated nominally at the standard wattages, but since they have increased electric current loads, special ballasts are required. One can figure that, in terms of available light, they give almost thirty per cent more and are particularly useful when heat load or space considerations force one to use fewer tubes.

Over the years, many inventions have resulted in the development of lamps which do or do not require starters. It is recommended that rapid-start lamps without starters be used because of lower costs and greater efficiency.

Lamp Installations

At the outset, it must be recognized that once the basic requirements are fulfilled in terms of quality and quantity of light, the exact size, arrangement, and design of a lamp installation are really the choice of the person who has to live with it for many years. Some people prefer a very functional looking unit and have no objection to metal frames and exposed wiring (Figure 7). Others would prefer more elaborate installations to blend with their home decor. One of the many books on indoor gardening might offer ideas on this aspect of the problem.

Based on the preceding theoretical discussion, it is clear that any installation should try to provide sufficiently high levels of blue and red light for the high light energy photosynthesis reactions and adequate balances of blue, red, and far red light for the low light energy photomorphogenetic reactions. These are our quality and quantity factors. The duration factor is the most easily handled. An inexpensive time clock (adequately rated to cover the wattages to be used) can be installed to avoid turning lights off and on manually. We can view the problem of installations as involving setups composed solely of either incandescent or of fluorescent lights or those composed of combinations of incandescent and fluorescent lamps.

Fluorescent Installations

Total lighting from fluorescent lamps is practical, and the installations may be decorative. Several of the available books suggest that there should be about 20 watts (rated wattages are marked on the ends of all tubes) for each square foot of plant-growing area, with the lamps about fifteen inches from the plants. I prefer somewhat higher wattages, up to 30-40 watts per square foot, to allow for the growing of somewhat larger plants together with smaller ones. To bring these figures down to reality, suppose that the selected growing area was to be four feet long and two feet wide. This means that the plant growing area is eight square feet. The 40-watt fluorescent lamps are just about four feet long, so we can use them in our installation. The question is, how many fluorescent lamps are required? If we stick to the rule of 30 watts per square foot, we need 240 watts or six of the four-foot, 40-watt fluorescent tubes. These can be mounted as a bank of lights, where the lamps are centered at intervals of four inches apart with the outside lamps being two inches from the ends. Since the lamps

Figure 7. A large fluorescent lamp system in a crafted wooden cabinet.

are four inches apart, the light will not be perfectly even below the bank but will show a series of peaks and troughs corresponding to the center of the tube (peak) and the mid-point between adjacent lamps (trough). If the lamps are placed not less than twelve inches above the middle of the plants, the variations in intensity will not be sufficiently great to modify plant growth, and they will not be perceptible to the eye.

Yet this presumably simple installation is, as any electrician will tell you, not so simple as it looks. In the first place, there are no commercial fixtures which will hold six lamps on four-inch centers. In the second place, the ballasts for these lamps should be away from the lamp bank so that their heat does not contribute to the heat load impinging on the plants. In the third place, such a unit of six will be heavy and will require cross-bracing of the frame on which the lamps and their sockets are held. In short, such an installation is really a good one, but not the type which can be whipped together with paper clips and Scotch tape. Its construction requires the assistance of trained personnel and the cost is correspondingly high. One can get two commercial "three channel" units and bolt them together for the light coverage of a two-foot wide planting area, but the lamp spacing will not be quite right, the ballasts are part of the porcelainized metal unit, and there is still the problem of mounting an even heavier unit. In addition to all this, a bank of lights such as are seen in Figure 6 is really rather ugly (not the model, however) unless mounted in a crafted unit (Figure 7).

There are three ways out of this dilemma. First, a competent electrician can make a lamp bank as described above, and a cabinet maker can frame it and mount it as a pleasing installation of your own design. A second solution is to purchase one of the types of plant stands sold by various seed companies and plant

Figure 9. A stacked multiple fluorescent lamp unit for growing large numbers of seedlings.

Figure 8. A single fluorescent lamp installation for table use.

supply companies. One such unit, sold by the George W. Park Seed Co., Greenwood, South Carolina is shown in Figure 9. Here the manufacturer has avoided the problem of trying to have one wide installation by mounting several narrower units, one above the other on a plant stand frame. These can be purchased or constructed.

The third method is the result of a very recent development in fluorescent lighting by the General Electric Co. General Electric has developed a square fluorescent panel whose light is of the Cool White character and whose other physical characteristics are essentially identical to the more conventional tubular fluorescent lights. Dr. Henry Cathey of the Plant Industry Station of the United States Department of Agriculture in Beltsville, Maryland, has designed attractive plant-growing installations using these new panel fluorescent lamps and several are shown in Figure 10. In addition to the designs presented here, flat banks of panels can be constructed to cover larger growing areas. Because of the design of the panels, the ballasts can be mounted away from the lamps, thus avoiding the problem of heat. Based on the wattage characteristics of these square fluorescents, a working distance between plant and lamp can be as great as eighteen to twenty inches. I can also add that these panels can easily be covered with a single sheet of DuPont Mylar W to remove the near-ultraviolet radiation which I mentioned earlier.

One other type of fluorescent fixture should receive more attention for indoor lighting of plants. Most of us have seen or even installed the Circleline lamps in kitchens and basements. These are now available as completely fabricated units designed to hold one, two, or three concentric rings of fluorescent lamps. If the three-lamp unit is used, a total of 96 watts covers a vertical area of two square feet. It is permissible on physical grounds to assume that fairly even illumination will actually cover about three square feet, giving quite adequate illumination. Such circular units can be used to supply even higher light intensities by replacing the outer, 40 W Circleline lamp with the special High Output circular 40 W lamp, a structural modification which can be made by many electrical supply stores. With this modification, a three and a half square foot area can be

adequately illuminated at a plant-to-lamp distance of three feet. This makes Circleline fixtures very practical for tall units used as accents in the corners of a room or in the usually dark foyer areas of apartment buildings (Figure 12).

Incandescent Installations

There is less adaptability in design or installation with units composed solely of incandescent lamps. The major physical obstacle is that of the heat load impinging on the plants, since only a small fraction of the total radiation emission from incandescent lamps is light, with the major fraction being infra red or heat radiation. This means that the lamp-to-plant distance must be greater, with three feet being a good rule of thumb. The bullet type aluminum reflector around either standard incandescent lamps or the reflector spot or flood lamps permits a reasonable amount of directional control with no increase in heat load. One favorable feature of incandescent lamps is that they are generally more pleasing and "natural looking" than fluorescent lamps, which tend to look somewhat cold. In the installation seen in Figure 13, the plants are on a metal tray which is fitted inside a Formica-laminated box. Adequate moisture is supplied by filling the tray with quartz river gravel and water. Incidentally, in spite of what you may read, Formica or Plexiglas cannot be used as the tray; they absorb water, swell and, if tightly bonded to the sides of the box, will eventually crack. I know this from bitter experience.

Many individuals have wanted to be able to light a large plant from above, in the corner of a room, in order to spotlight it. In the past, the only available lamps were the incandescent reflector spot and flood lamps, which have average burning lives and which usually do not supply sufficient light at a distance beyond three feet. The new Iodine Quartz lamps of the reflector spot or flood design answer this problem. The 500 W rated lamps are almost equivalent in light output to a 750 W standard lamp and will provide adequate illumination at a distance of three to five feet, depending on the species and size of the plant to be lit. (Parenthetically, they are excellent for spotlighting Christmas trees on lawns.) Since there are several styles of these special lamps, a visit to the electrician would be advisable.

Fluorescent-Incandescent Installations

We have seen that the Cool White fluorescent lamps by themselves are excessively high in the green and low in the red and have a poor red to far red ratio. We have also seen that the Gro-Lux type are high in blue and in a red which is not quite right for the low light energy reactions but is good for photosynthesis. They have the advantage of being low in the deleterious green rays but, like the Cool White lamps, they have a poor red-far red ratio. Finally, we have seen that the incandescent lamp is low in the blue, has a good green balance, excellent red radiation, and a very good red-far red ratio. This indicates that a combination of fluorescent and incandescent lamps might be the most satisfactory arrangement for plant growth and, indeed, this is the case. Current evidence suggests that even the Gro-Lux lamp, usually reported to be all that a plant ever needs, is more effective when supplemented with incandescent lighting. Certainly, every research installation I have ever seen is designed to use both fluorescent and incandescent lamps.

The first question that is usually asked is obvious and, like most obvious questions, rarely brings forth a completely satisfactory answer. No, we still don't know exactly how much incandescent light should be used to supplement fluorescent light. A few years ago, it was assumed that a 1 to 10 ratio was adequate. That is, for every rated watt of incandescent light, there should be 10 rated watts of fluorescent light. If you had 240 watts of fluorescent light, as from six 40 watt tubes, it was assumed that 20 to 25 watts, from three 7 watt incandescent lamps placed evenly throughout the bank of fluorescents, would be satisfactory. Photobiologists then concluded that to get a good red-far red ratio relative to the rather high blue output of Cool White fluorescent lamps, it might be better to go to 1 to 5, that is, about 50 watts of incandescent to the 240 watts of fluorescent. This could be accomplished with five of the small 10 W incandescents spaced evenly throughout the bank. Today, I believe that a 1:1 ratio might be more satisfactory. This would require (again for our hypothetical 240 fluorescent watts) as many as ten of the 25 watt lamps. This means that there would be quite a heat load and, except for temperature-controlled growth rooms, such an arrangement is likely to be impractical. However, a 1 to 5 ratio will give good results for almost all plants.

Now, how can this be achieved with reasonable expense? It is rather difficult to do with the panel-type fluorescent lamps, although the installation of several inconspicuous Lumeline lamps between panels can be done by the electrician who makes up the panel unit. These are thin, shorter, tubular incandescent lamps designed for showcase illumination and available in 60 W and other sizes. One of the Lumeline lamps for every two panels is adequate.

For larger flat banks of fluorescent tubes (back to our hypothetical six of 40 watt lamps again), five or six of the 10 watt incandescent lamps can be wired in at the same time the unit is constructed. If the extended service lamps are used, I suggest that you use the 15 W rated lamps.

For three-lamp Circleline fixtures, the problem is fairly simple. Any electrician can install a standard screw-type socket in the bull's-eye of the fixture. Since total fluorescent wattage with the 40 W High Output lamp is equivalent to 120 W, a 30 W reflector flood lamp will do nicely. Again, increase the wattage to the next wattage size if extended service lamps are used.

Hints for Artificial Light Installations

Good horticultural practice is just as necessary, and perhaps even more necessary in artificial light installations than under field or garden conditions. In addition to the light, the plants must be in a soil suitable for their development, must be given the proper amounts of water, and should be grown under conditions of reasonable

humidity and temperature. The last two requirements are very difficult to control in city apartments. Since the lights, whether fluorescent or incandescent, emit a certain amount of heat, it is always a good idea to keep the room as cool as personal comfort dictates. There is a hidden benefit in this, one which was not really known until a few years ago and is still not understood. This is the concept of the thermoperiod. What this boils down to is the fact that a diurnal rhythm of temperature is almost as important as a diurnal rhythm in light. Although there are variations among plants, a good general rule is to attempt to have the night (dark) temperature 5°-8°F. below the day (light) period. By having the room cool, the thermoperiod requirement is automatically taken care of, for as the lights go off, the temperature of the plants will drop.

Humidity control is, as any sinus sufferer can tell you, the most difficult to control. Merely supplying adequate water to the soil will have very little effect on the humidity around the above-ground parts of the plant. Because of heat radiation from the lamps, many artificial lighting installations are almost bone dry, and there is correspondingly less adequate plant growth. Spraying the plants with a hand mister at least once, and preferably twice a day, will help, and you will be surprised at how quickly the moisture disappears. The installation of a humidifier in the room will be a big help to the plants as well to human occupants.

Many lighting installations are constructed with enclosed sides for aesthetic reasons and in an effort to control the relative humidity. These units are called

Figure 11. This planter box in the corner of a living room is equipped with incandescent lamps.

Figure 10. Two different designs for planter boxes use the new General Electric panel fluorescent lamps. (Photos courtesy of Dr. Henry Cathey, United States Department of Agriculture, Beltsville, Maryland.)

Wardian chambers and may be of plastic or glass for maximum visibility or may have wooden or other opaque sides with a see-through front of glass, rigid plastic, or a flexible plastic such as cellulose acetate sheeting or polyethylene. Where opaque sides are used, the total radiation can be increased by either painting the sides with white enamel or by covering them with aluminum foil. Foil is preferred since its reflectance is higher. The total light impinging on the plants may be increased as much as twenty to thirty per cent by this method.

The enclosed unit holds humidity, but it also holds heat; and it is not unusual to find that the internal temperature of an adequately lighted Wardian chamber may become much too warm for the best growth of many plants. Allowing some exchange with the outside by opening the doors somewhat will have relatively little effect on the humidity at plant level and will allow some heat to escape. Mounting the lights outside the chamber will help to lessen the heat load. The installation of a fan which blows across the lights to sweep away some heat is also helpful. There are rumors that several of the glass manufacturers are developing transparent glass sheets which absorb the infrared radiation. This may allow the construction of Wardian chambers with heat-resistant glass tops through which light but very little heat will be transmitted. This is still in the future, however.

In addition to these other measures, the installation itself should have some reservoir of water which, through its evaporation, will keep the installation cooler and will also raise the relative humidity around the plants. This usually takes the form of a water-impermeable pan on the bottom of the unit in which water can remain and on which the pots are placed. This pan can also be filled with gravel of interesting sizes and colors which adds a decorative touch and also increases the surface for evaporation of the water. The pots can be placed on the gravel or between the gravel particles, if they are in little plastic pot liners. Water should be added as needed. There is a tendency for this water reservoir to become dirty and algae can also grow in it. A schedule of removing the pan and washing it can be synchronized with the necessary removal and washing of the plants. Where there is no danger of the water coming in direct contact with the pots, the addition of a very small amount of copper sulfate to the water (1 gram for every gallon of water) will prevent the growth of algae and fungi. Copper sulfate can be purchased from any druggist; ¼ teaspoon equals 1 gram.

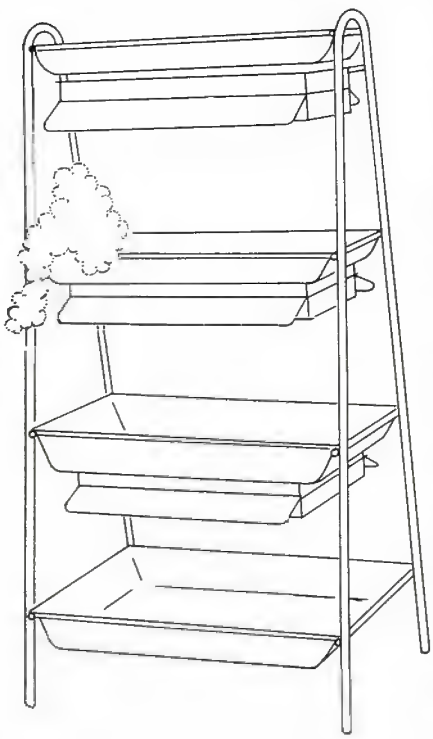
Artificial illumination can be used to start seedlings in the early spring for transplantation into the outdoor garden. The lighting system for seedling growth differs only slightly from that needed for the continuous cultivation of plants, but these differences are important. Sturdy seedlings are formed when the ratio of red to far red light is in favor of the red light. With higher levels of red, the seedlings tend to be greener (more chlorophyll is synthesized) and shorter (red favors short internodes), and to have well-developed leaves and stems which are not excessively succulent. For early seedling development, the lamp system should favor fluorescent lamps, since incandescent lamps have a level of far red radiation which opposes the effects of the red light. Some investigators use a combination of Cool-White fluorescent lamps and either red fluorescent lamps or the Gro-Lux type lamps. These combinations are high in red but low in far red light. Since many seedlings do well under conditions of slightly higher temperatures than do more mature plant, the lamps can be placed closer to the seed bed. The high light energy reactions of photosynthesis are also facilitated by this close positioning. It is suggested that a fairly good arrangement would be 80 watts of fluorescent light composed of one each of the 40 watt Cool White and the 40 watt Gro-Lux lamps. The bottom of the tubes can be as close as six to eight inches from the tops of the plants, with the distance increasing as the plants become taller.

The development of seedlings is also favored by an increase in the temperature surrounding the roots. The heating cables sold by many seed companies will do nicely to supply bottom heat. Directions for the installation of heating cables usually accompanies the heaters. Of course, increased heating of the root system will also favor the development of molds, including the damp-

(Continued on page 196)

Figure 12, right. Design for a planter unit for tall plants, using Circleline fluorescent lamps and a reflector-flood incandescent lamp.

Figure 13, below. Design for a multiple tray unit using fluorescent and incandescent lamps.



Marginal shield-fern, *Dryopteris marginalis.*

What Are Your Chances For

A BOG GARDEN?

By Charles O. Masters

Mr. Masters, whose vocation is sales with Aquarium Systems, Inc., of Wickliffe, Ohio, finds relaxation in farming and in writing about aquatic plants and animals for those who are interested in gardens and aquariums.

Golden-club, *Orontium aquaticum.*

Plants which thrive on wet or soggy soils are so very different in their requirements from those grown in the usual gardens that more and more gardeners are attempting to duplicate bog conditions on their home grounds. Some succeed, others fail. What are your chances at success?

By definition, the bog garden serves as a place for the cultivation of plants which normally inhabit only marshy areas. It must be so developed that it is natural in appearance, distinctively attractive, and fits well into the surroundings.

Completely artificial bog gardens, although it is possible to create them, are not nearly so satisfactory as those which have been adapted from whatever natural features are available. The fact that the site is a low-lying one, on which rain and snow water settles during much of the year, is not sufficient reason to consider it as a potential marsh. A great deal of ingenuity would be required to convert such a situation into a bog garden, since excavating and sealing with clay or cement would have to be done. It is much more desirable to work with the margin of a pond, the bank of a flowing brook, or a gushing spring, any one of which would assure a constant and adequate supply of water. A lily pool, already located on the property, can also be used to furnish boglike conditions.

Home gardeners find out sooner or later, once they have undertaken a bog garden, that it takes more than a dark, barren corner of their grounds, in which nothing else will grow, as a foundation upon which to develop this fascinating type of garden. It is generally true, however, that since such a corner is nonproductive, very little is lost material-wise and something is gained in experience, if one does attempt to create a bog garden there.

The requirements of the plants should be foremost in mind throughout the planning, construction, and maintenance of the bog garden. Bog plants will sometimes live in soil which is not wet, and some will even adapt themselves to life under water, but it is advisable to duplicate the conditions of their natural habitats as closely as possible.

Whatever the size of the area, whether it be extensive or limited, it must be wet and poorly drained so that it will retain moisture, and most of, if not all the site should be in full sunshine. Where shade is necessary, it can be obtained by placing tall plants in strategic locations. Low-growing plants should be used only along the southern side.

Marsh plants make an effective background setting along the boggy, shoreline of a lily pond. The composition of the entire garden can be built around this portion. This is also true, if you are so fortunate as to have a brook or small stream flowing through your property. The wet area along the bank can be cleared and transformed into a beautiful show the year around by the use of moisture-loving plants.

It must be emphasized again that from the very beginning the bog garden must be properly prepared. Clay or cement can be used in relatively small areas to hold water and keep the soil moist. But remember—marsh plants are accustomed to wet feet, but not to swimming! The soil must be rich and acid (ph 4.5-5.5), containing a goodly amount of decayed humus and fiber. (If

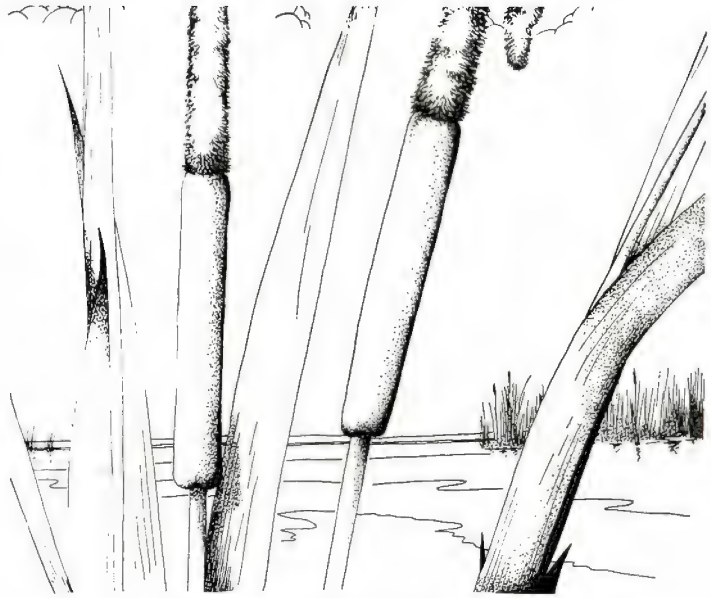
necessary, such soil can be brought to the proposed bog-garden site.) Natural bog soil is ideal, so if you have a marshy area, much of your work is done. Some gardeners will insist that the richness and the acidity of the soil are more important to the well-being of the plants than is moisture, and that the condition of the soil might be the keynote of success. Soil acidity may be retained by the occasional addition of decaying leaves, and top-dressing of sawdust or peat moss. Cultivation of the soil is definitely not recommended, even if it were practical.

After the basic requirements for the bog garden have been met, consideration must be given to the selection of plants "at home" only in marshlands. And while it is altogether possible to "go overboard" and choose a goodly number of unusual species—because they are certainly available—it is advisable to confine your initial selection to those which will readily adapt themselves to the existing conditions. You can, of course, acquire desirable species from time to time.

It is important to arrange the plants so that there will be no clashes in color and no encroachment on one species by another. Good use can be made of foliage plants to break the lines between the species which bear bright flowers. The plants should be set in clumps with no attempt at integration, the patches of bare soil between the different clumps soon filling in.

Plantings from the deep areas to the shorelines should be completed, keeping in mind the special requirements of each species, and then the bank and background plantings should be arranged to emphasize an harmonious effect.

Mass plantings of the cat-tail *(Typha latifolia)* are best suited to the water-line of a lily pond where it comes close to the background slope. Only a clump or two should be separated and included in the entire area, since the cat-tail tends to spread rapidly.



Broad-leaved cat-tail, *Typha latifolia.*

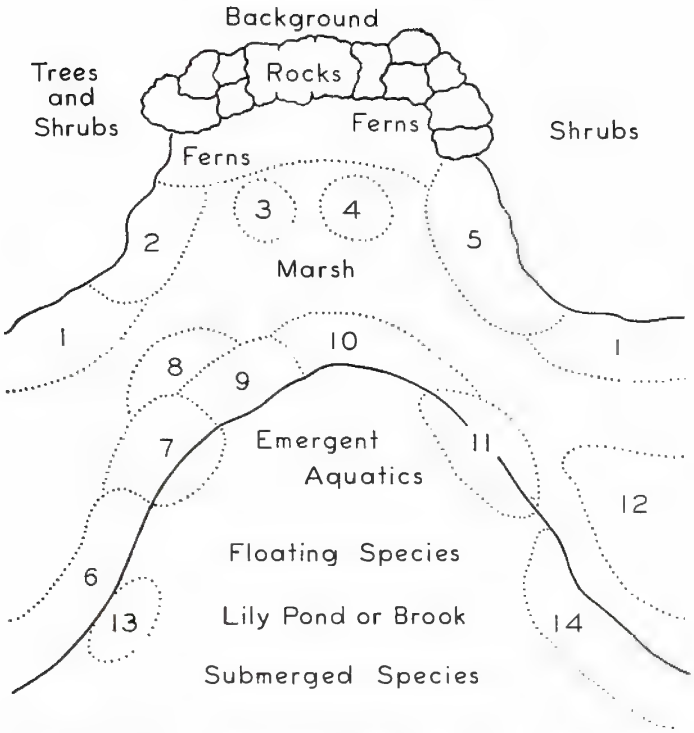
Certainly the marshy outline should not extend around the entire pond nor along the entire bank of a flowing brook. Sections should be characteristically free from conspicuous vegetation. Mosses and liverworts serve well to cover the line where water and soil meet.

Ferns are happy in a bog garden—some with water near their roots, others away from the shoreline in drier soil, still others among the rocks along the bank of a brook. Requirements of the particular species, such as cinnamon-, interrupted-, and royal-ferns *(Osmunda cinnamomea, C. claytonia, C. regalis),* American maidenhair-fern (*Adiantum* pedatum), ostrich-fern *(Pteretis pensylvanica),* marginal shield-fern *(Dryopteris marginalis),* hay-scented fern *(Dennstaedtia punctilobula),* and so on, should be carefully determined before they are planted.

The higher background, besides being an artistic part

Marsh buttercup, *Ranunculus septentrionalis.*

Broad-leaved arrowhead, *Sagittaria latifolia.*



1. Yellow flag, *Iris pseudocorus,* and blue flag, *I. versicolor;* 2. squaw root, *Trillium erectum;* 3. *Gentiana andrewsii;* 4. fringed gentian, *G. crinita;* 5. Canada lily, *Lilium canadense;* 6. bog-bean, *Menyanthes trifoliata;* 7. cardinal-flower, *Lobelia cardinalis;* 8. nodding trillium, *T. cernuum;* 9. *Primula bulleyana;* 10. marsh-marigold, *Caltha palustris;* 11. forget-me-not, *Myosotis scorpioides;* 12. pickerel-weed, *Pontederia cordata;* 13. broad-leaved cat-tail, *Typha latifolia;* 14. broad-leaved arrowhead, *Sagittaria latifolia.*

of the bog garden's composition, provides protection from stormy weather and destructive winds. Sturdy shrubs and trees should be kept on the northern and eastern limits. Hardy herbaceous plants are also useful there.

A number of nurseries list the plants for bog gardens, but now and then it is possible to collect these plants, *with permission,* from sunny and shady spots in marshlands.

Your bog garden will eventually become a cool, green oasis to which you can retreat on dry, hot summer days when the usual garden chores seem more burdensome.

THE QUEEN OF ORCHIDS
CYPRIPEDIUM REGINAE

By GEORGE A. ELBERT

Mr. and Mrs. Elbert, enthusiastic amateur botanists, write and lecture about the interesting places they visit to study and photograph native plants in their natural habitats.

WE MARVEL, when viewing a large collection of orchids, at the prodigality of nature. Some of the blooms are grotesque, others charming, some are of a fantastical complexity, others simple and neat. They come in many colors and color combination, and range in size from large six-inch blooms to ones so minute that a hand-lens is required to see them.

The United States is not considered as being especially endowed with orchids. Indeed, many people are surprised when told that they grow north of tropical Florida. And mentioning that Labrador and the Aleutians possess them may cause one's veracity to be questioned. Yet we do have a rather large and representative group of the Orchid Family. In Gray's *Manual of Botany,* which covers only the northeastern United States, 168 plant families are described. and the orchids stand tenth in number of species and genera.

Many of these plants have large clusters or long racemes of flowers. But only one genus, *Cypripedium,* produces single blooms of considerable size. Among them are the familiar pink and yellow lady's-slippers. Attractive species are found in Japan, Russia, and Europe—in fact, throughout the northern temperate zone.

Recently I have become somewhat familiar with the appearance of orchids, both epiphytic and terrestrial, from different parts of the world. Yet in comparing their merits I have come to the quite personal conclusion that we, in America, possess the most beautiful orchid of all. It must have been much the same feeling which inspired Thomas Walter (1740-88), an Englishman who settled in South Carolina, to give this member of the genus *Cypripedium* the epithet of *reginae*—of the queen or queenly. And though other orchids are flashier, none can compare with it for the quality to which we apply the description of noble. *C. reginae* is commonly called the showy lady's-slipper.

I should not make so pretentious a claim if it were not that I, and others who know it, admire this plant and that for many of us it is the most cherished of our wild flowers. How sad it is that Gray's, not a publication noted for emotional outbursts, must say, "Plant liable to extinction through raids by nurserymen and would-be cultivators." Despite laws enacted, but unenforced, for its protection, it is slowly being eradicated. Enough people covet this flower to make collecting a profitable business.

The beauty of *Cypripedium reginae* derives from a unique combination of habit, leaves, and flowers. Few orchids are notable for their handsome foliage. The most that can be said of the leaves of the epiphytes is that they are utilitarian, and those of the terrestrials are not much better. Only the leaves of the showy lady's-slippers are truly lovely.

This is a strong-growing, compact plant, up to three feet tall, but giving the impression of being much bigger. The thick, straight stem is sheathed by large, light green leaves which are covered with a dense, short fur of velvety texture. Although the hairs are an ineffective defense in the long run, it is some consolation to know that they may cause a severe skin rash to greedy bouquet gatherers.

The stem, rising slightly above the last leaf, bears one to three compact flowers, up to three and a half inches across. Sepals and petals form a fan of brilliant white and just below, jutting out in front, is the extraordinary lip. It is a round sac, like a miniature coracle, channeled like a melon and striped and suffused with red. The color appears at times as a mass of thickly scattered

granules, sometimes they seem to run together; the suffusion varies considerably. At the center of the flower the column crosses over the opening of the sac and plunges vertically downward. It is bright yellow and, in the angle, the large pollen masses can just be seen. Behind the flower is a floral bract which points up perkily like the feather of an Indian brave.

The showy lady's-slipper is frequently found on or near a mossy bog which is a bit acid above and neutral near its roots; a continuous supply of moisture is required. Its range is from Newfoundland to Manitoba and New York to Wisconsin; the high ridges of the Appalachians carry it farther south. The plants are most numerous in Canada, especially in the Province of Ontario. Minnesota admires it sufficiently to have chosen *C. reginae* as the state flower.

Because we did not travel far enough to the north and were ignorant of the approximate dates to look for it, we wandered a number of years before we came upon our first showy lady's-slipper. One year, on a weekend trip in the middle of June, a bog in southern Massachusetts attracted our attention. The presence of tamarack was a hopeful sign, for we had learned that where tamarack grows conditions are often suitable for this orchid.

After clambering over the typical boggy hummocks, we came to a little clearing filled with tussocks of long grass. Here, where the filtered sunlight was stronger than in the denser parts, we found a small clump of *C. reginae,* unmistakeable because of its huge leaves. Bending down the tips of the stems with their weight were a number of buds of uncomparable elegance. As big and about the shape of small hen eggs, they glowed white, delicately suffused with pink, so inflated that they looked as though they would burst open or float away. Jubilant at our discovery we returned the following week and saw them in perfect flower. Never before or since have we been so deeply moved by the first sighting of a plant.

Another long period passed before we again had the opportunity of seeing the showy lady's-slipper at its best. For it is one thing to discover isolated specimens and another to have the good fortune of seeing them en masse in a perfect setting. Some years later we found groups of *C. reginae* at several different locations in a wild section of northern New York rich in streams and bogs, and one station yielded the ideal moment.

Along a country road we noticed a dark mass of cedar and tamarack between two knolls covered with hayfields. The area is full of big and little bogs which look much alike; naturally we explored the big ones first. This one bog was smaller than most, clinging to the shore of a little brook. Surrounded by cultivated land, it seemed a most unlikely place to find anything out of the ordinary. Yet there was one impelling reason for checking the place.

Most of the soil of the East is decidedly acid. Limey areas are usually of no great extent, yet are particularly interesting as the habitat of many lovely species requiring neutral conditions. Although *C. reginae* is not dependent on a strong lime content, it often flourishes where it is present. During our drive we had passed a lime quarry and were alerted to the possibilities of any

Showy lady's-slipper, *Cypripedium reginae*, and, below, a clump growing in a bog in northern New York.

moist areas in the immediate neighborhood. However, we were not thinking of *C. reginae* when we stopped the car.

The floor of the bog was covered to a depth of about a foot and a half by an unbroken blanket of three species of *Equisetum, E. variegatum, E. sylvaticum*, and *E. fluviatile*. These feathery primitive plants created a light green, gently undulating froth. We were not conscious of the trees so much as of their straight, dark trunks spaced rather widely, like columns in a Moorish mosque, and the misty lighting interrupted occasionally by thin shafts of greater brilliance. As on some magical

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THE GEORGES TRUFFAUT NURSERY

In Versailles, France

By Alice Dustan Kollar

Mrs. (Samuel) Kollar is a landscape consultant, author, lecturer, and the Garden Editor of the *Newark Star-Ledger*. She is an instructor in the Educational Program at The New York Botanical Garden, and this fall will give the course in "Planning and Planting the Home Grounds: Plant Selection." Mrs. Kollar will also lecture at the Garden on December 10, 1966, in the Fall-Winter 1966-67 Saturday Afternoon Lecture Series; her subject, "Spacious Region around LePuy, France."

WHAT KIND OF A GARDEN would we have if we lived abroad, and what would be our favorite plants? These questions were answered for us in general terms by a rapid but quite complete tour through the large Georges Truffaut Nursery in Versailles, about an hour from Paris by train.

At the suggestion of an American rosarian who had admired it, we made a point of visiting this nursery's rose display on our June, 1965, trip to France. The large formal garden, about a mile from the entrance to the palace grounds, is open to the public throughout the rose season, as well as in spring for the spectacular bulb display.

Entering the Truffaut property, we walked along a curving driveway attractively bordered by lawn and mature plantings of rhododendrons and shade trees. Passing the nursery's main office, we came to the rose garden with its colorful beds accented here and there by charming statuary and accessible by paths for close viewing.

The garden background at one side consists of climbing roses which partially screen the company's packing sheds and parking area. At the far end, tall Lombardy poplars back an arbor which covers a raised walk and terrace. From this vantage point visitors may enjoy the whole rose garden in pattern, then turn around to look down on quite a different landscape feature—an informal pool with naturalistic plantings.

The formal rose garden of the Georges Truffaut Nursery has an arbor-covered walk and Lombardy poplars as background.

After browsing and taking numerous color shots of both formal and informal gardens, we entered the Truffaut office building toward noon. There my husband and I had the pleasure of meeting Jean-Claude Devillers, the Director, who offered to show us through the nursery's sales grounds and production fields on the other side of the city.

Fortunately for us, who are none too fluent in French, M. Devillers speaks excellent English. He spent two years in the United States as a Fulbright scholar, working at Beltsville, Maryland, under Dr. S. L. Emsweller of the United States Department of Agriculture.

Monsieur Devillers drove us across town and into the company's extensive nursery grounds, fairly deserted at that off-season. Starting our tour where most French visitors do, we walked up and down paths which separate narrow beds filled with perennials and small shrubs, all

Across the driveway from the rose garden, with its central pool, stand the nursery's main office and packing houses.

Beyond the formal rose garden near the main office, a flagstone walk invites visitors to explore informal plantings beside a pond.

Right. Jean-Claude Devillers, Director of the Truffant Nursery, stands on a flagstone path in the "living catalog" of the sales grounds.

neatly labeled. This "living catalog" is supplemented by a sizable greenhouse filled with cut material. We paused to admire the latest in tall bearded iris, well labeled and beautifully staged for the pleasure and education of the nursery's public.

Next we were taken through one of several two-story buildings which contain field machinery and facilities for packing plants to be shipped. Plants in the Truffaut Nursery vary in size and kind from small rock garden species to huge conifers which require special equipment when being moved and placed. Weeping Atlas cedar, *Cedrus atlantica pendula,* is one of the rare trees we noticed among the big specimens just beyond the buildings.

Asking M. Devillers about these trees, we learned that the company has a landscape department—its office is across the highway from the nursery grounds—and many of the planting projects call for large material. Customers of the Truffaut Nursery are as eager to achieve immediately that "well-established look" as are garden owners in America.

From mediaeval times Frenchmen have trained pears, apples, plums, and other fruits against garden walls. Such espaliered trees are just as popular today, if the field of young trees attached to wooden frames on the Truffaut grounds is any indication. Espaliered trees seem to grow and produce better in the gentle climate of

A field of young trees, espaliered on frames, interests an American visitor who is being escorted through the nursery by M. Devillers.

The greenhouse at the sales grounds displays irises and other seasonal flowers in vases, as well as potted tropicals.

In this block of climbing strawberries, each thrifty plant is supplied with its own eight-foot bamboo pole.

France than they do in this country, and French gardeners appears more adept at pruning than their American counterparts.

Climbing strawberries are popular in France, too. On our June tour of the Truffaut Nursery, we passed a large plot of thrifty plants just starting to climb their eight-foot bamboo poles. Across the path was a low greenhouse in which the strawberry plants are fumigated, to assure freedom from disease, before they are shipped to customers.

Spraying and other forms of garden maintenance are important considerations for French gardeners just as they are for us here. M. Devillers told us that various garden chemicals account for about one-third of the sales at the Truffaut Nursery in Versailles.

Adjacent to the block of strawberry plants was a row of vines which looked vaguely familiar. They were actinidia, but of a species new to us. This Chinese form (botanically *Actinidia chinensis*) is not just an ornamental vine with attractive white flowers, but one which produces edible fruits. Said to be rich in Vitamin C, the

Climbing strawberry plants are fumigated against disease in this greenhouse before they are sent to customers.

one- to two-inch-long, yellow fruits have a pleasant flavor described as a blend of strawberry and currant. (To our knowledge this fruiting vine is not yet listed in American nursery catalogs.)

The Truffaut Nursery has many acres devoted to production, for fruits and ornamentals of every sort familiar to gardeners in the New York metropolitan area—and some besides—are raised by this nursery near Paris and shipped to all parts of France. It also carries a long list of perennials and bulbs, and many different kinds of seeds. A typical collection offered in the company's seed catalog would appeal to gardeners on this side of the Atlantic; shown in color are named varieties of zinnia, verbena, snapdragon, dianthus, California poppy, and English daisy.

Bulbs, both hardy spring-flowering kinds and tender summer types, appear to be very popular abroad. An unusual feature of the Truffaut Nursery grounds is a circular building especially designed with a foundation of cellar depth for the winter storage of dahlia tubers.

As in America, gardeners in France are eager to grow herbaceous material and shrubs for succession of bloom and roses for their long season of color. Roses in the Truffaut Nursery catalog include such American varieties as 'Sterling Silver' and 'Goldilocks'.

We were also pleased to learn that this nursery stocks some American plants to provide fall color to the French landscape—the sweet gum, red oak, and staghorn sumac in cutleaf form.

FOR WHOM CAMELLIAS BLOOM

By MARGARET MCMAHAN

Reprinted with permission from the *News and Courier,* January 27, 1965, Charleston, South Carolina.

THE INCOMPARABLE CAMELLIA is named for Georg Joseph Kamel, a humble Jesuit missionary who labored in the Philippines. Each year the flower gives evidence of his lasting services, his exemplary character, and makes amends for the long neglect of his memory.

Dictionaries describe Kamel as "a Jesuit who brought the camellia from the East," "a Jesuit traveler," and "a Moravian Jesuit missionary." Actually, the "traveler" for whom the great Swedish botanist, Linnaeus, named the genus *Camellia* was a Jesuit lay brother who lived in Manila for twenty years, never returned to his native Bohemia (Moravia), part of present-day Czechoslovakia, and died there on May 2, 1706.

He lived, labored, loved, and died at the Jesuit College of San Ignacio in Manila, located within the old Walled City (Intramuros), occupied today by the ruins of the Thirty-first Infantry barracks.

Brother Kamel was famous in his day not only in the Philippines, but abroad; after his death he faded into obscurity, not because his services were valueless, but because his writings were incorporated in those of others, and his identity lost, and because there were unfair judgments of his work.

Pharmacy was the key to his life, the wellspring from which arose other scientific interests and activities. Beginning as a pharmacist, he became a botanist, a physician, a religio-medical counselor, a medical missionary, a naturalist, and a scholar.

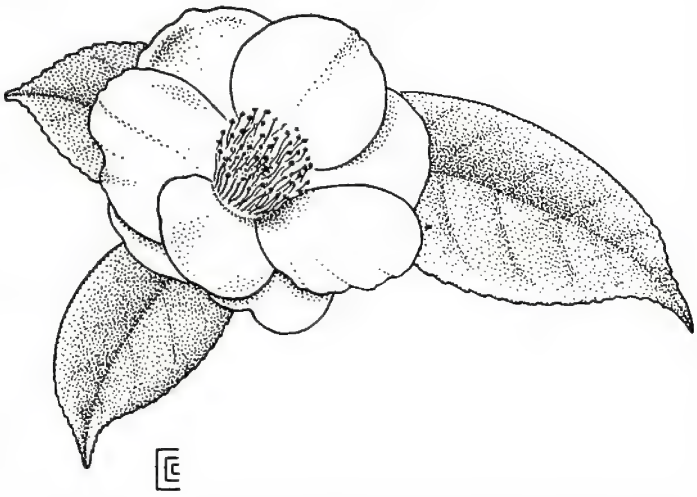
Georg Joseph Kamel was born April 12, 1661, the son of a printer, at Brunn in Bohemia, where there was a centuries-old tradition of careful pharmaceutical education. Both the state and the universities made provision for the preparation and practice of pharmacy. Scanty records do not reveal whether Kamel was a master pharmacist, but he was given practical tests and oral examinations and, undoubtedly, had a sound pharmaceutical training. Dates and details of his attendance at the Jesuit College at Brunn are not available, but it is recorded that he entered the Society of Jesus November 1, 1682, when he was twenty-one years old. Three years later he was in Neuhaus, Bohemia, and was listed in the catalogue as "assistant infirmarian and pharmacist." That same year the triennial catalogue of the Society of Jesus contained an entry, "Georg Joseph Kamel, Czech from Brunn, twenty-five years old, three years in the Society, knows German Czech; also Latin fairly well, pharmacist."

One year later, 1686, Brother Kamel was sent to act as infirmarian and pharmacist in the Jesuit College at Krummau, where the first pharmacy had been established in 1568. Its early important and extensive activities established a tradition which set the standard for the part pharmacy would play in the future.

Here Kamel studied and learned. . . . After two years he received his appointment to the Philippines. The college at Krummau reported in 1687, ". . . we transferred from the Old World to the New, our pharmacist, found worthy of Christ's holy missions in the East Indies."

Filled with zeal for the untried course before him, Kamel followed the route usually taken by missionaries via the Austrian Tyrol to Milan and Genoa, then by boat to Spain. On July 9, 1687, the young medical missionary set sail from Cadiz on the Spanish galleon "Santisima Trinidad," captained by Juan Equila. The journey to New Spain (Mexico), often highly hazardous because of pirates and storms, was calm and uneventful.

The young pharmacist landed at Vera Cruz and traveled by mule back to Acapulco, where he boarded another galleon bound for Manila, arriving there in 1688. The next year the catalogue of the Philippine Province shows him attached to the College of Manila. His first task was to establish or reform the pharmacy, according



to the latest and best European standards. Native medicinal herbs were added to the European materia medica; and eventually he made his pharmacy independent of importations.

Soon Kamel's skill in pharmacy was exerting a wide and effective influence. He worked diligently and tirelessly in establishing a pharmacy for the relief of members of the province. It was a service which benefited not only the neighborhood of Manila but all the islands, because it offered a supply and variety of remedies for all kinds of illness. As he proved his ability, people came to him with great confidence. Sometimes the curanderos (practitioners without professional training) believed that the bigger the dose, the quicker the cure. Brother Kamel, with great forbearance and patience, would change the dosage, reducing it artfully. The definite improvement which followed was quickly noted, and Brother Kamel's name was on every tongue.

In a country where the treatment of disease was a strange mixture of herb therapy, magic, and quackery, Kamel was influential in creating a friendly attitude among the natives through the aid he rendered. And many people in exalted positions wanted to be treated by him and only him. Brother Kamel accepted these cases cautiously, only after authorization by superiors.

Kamel took his final vows August 15, 1696, in the Church of Sain Ignatius in Manila.

He worked in a rustic, quadrilateral building with an inner patio open to the sky. Around this patio was a paved corridor, separated from it by a low wall surmounted with pillars. Opening on the corridor were classrooms, the assembly hall, the offices of the province and college procurators, Kamel's pharmacy, and the printing press. Part of the inner patio was devoted to Kamel's plots of medicinal herbs, the rest to a rose garden. Three stairways, strategically placed, led to an upper floor and to the choir loft of the church. The community recreation room on this floor had windows overlooking the bay on one side, the city on the other. The bay-side view was unusually lively for there, as Murillo Velarde related, "one could watch all the galleons, dispatch boats, galleys, junks, and vessels of every rig imaginable coming in from or sailing out to America, China, Coromandel, Batavia, and other parts of the East, and the provinces of these islands." The walls of the recreation room and the corridor were decorated with portraits, maps, and landscapes. Next to the recreation room was the college library, and there were other rooms such as the community dining room, chapel, and infirmary.

Soberly and objectively, Kamel added to his precious store of scientific books and absorbed their contents. Soon he was very active in other scientific areas. He studied carefully the natural life of the Philippines and sought to establish relations with other scientists so as to make the "secrets" of that remote area available to them.

Dr. Samuel Browne, a physician of the East India Company, stationed at Madras, India, was an accomplished botanist and collector of plants. Manila merchants told him about Kamel, and soon thereafter Browne and Kamel were exchanging letters, plant specimens, and other collector's items. Browne was in communication with John Ray and James Petiver, English naturalists and members of the Royal Academy. Ray wrote *Methodus Plantarum Nova Brevitatis and Perspicuitatis,* one of England's outstanding botanical works, and his later works established him as one of the founders of modern zoology.

At Browne's request, Kamel sent him in January, 1697, drawings and descriptions of various Philippine plants, among them *Strychnos ignatii,* which Browne forwarded to Ray or Petiver. This was the first appearance of this source of strychnine in European pharmacy. Browne's letter inspired Kamel to prepare a supplement to Ray's *Historia Plantarum* from his knowledge of Philippine plants. He divided the work into three parts or books: the first on ground plants; the second on vines; and the third on bushes, shrubs, and trees. The two copies of this material, which were sent to Browne in 1698, were lost at sea, for the ship carrying them was seized by pirates. Kamel lamented that evidence of the work of ten years was lost in a day.

Kamel sent as soon as possible Book One, which he made from a copy he had kept. And, being able to get the copy of Book Three that he had lent to another scientist, he sent it to Ray. After many delays and frustrations, Ray received the first and third books and published them as appendices to his Historia. The second book did not appear, because very likely it did not arrive until after Ray's work had been published.

Kamel, believing Ray to be ill, finally sent the second book to Petiver, who published it in his *Philosophical Transactions.* Human nature is the same in all ages; and those staid scientists, Ray and Petiver, each jealous of the other, argued angrily over the ownership and right of publishing Kamel's notes. So the work of the faraway Kamel was published piecemeal, and thus he lost credit.

This second part or book discussed specimens and information which ranged far beyond botany—animals, birds, corals, and other submarines: fish, mollusks, and crustaceans; monsters and monstrosities; serpents, quadrupeds; spiders, beetles. It is evident from the correspondence that Kamel sent information, sketches, and

specimens of butterflies, moths, preying mantis, "walking" leaves, "unusual" flies, and a thirty-foot snake skin, probably that of a python. The range of his scientific interests was broad.

The communications of Kamel to Ray and Petiver are his only known published works, but Sommervogel says that Kamel "left two big volumes on medicinal herbs, which were never printed except partly in Petiver's *Philosophical Transactions* and in Ray's *Historia Plantarum*. More than three hundred of his artistic and meticulous drawings were not published. Today they can be seen at the British Museum in London and the Jesuit College in Louvain, Belgium.

Kamel made a lasting contribution through his introduction of the Philippine plant, *Strychnos ignatii,* from which strychnine was derived in 1818. He sent an excellent sketch of the plant, showing the fruit, the leaf (upper and lower surface) on a twig, and some seeds. This apparently was the first time the plant, its properties, and its medicinal value were described in Europe. The seeds of the plant, from which the drug is derived, are known in the Philippines as St. Ignatius beans—because *S. ignatii* grows only in the territory where the Jesuits formerly had spiritual charge. The scientist Delgado describing *S. ignatii* says, "It is so useful and helpful as a medicine that I believe that there is neither its like nor its equal in the whole world."

Inclusion of Kamel's work in the publications of the internationally famous Ray and Petiver proved the degree of esteem in which they held him. Ray referred to him as a "most famous man, destined by nature to advance the history of botany, most deserving of immortal praise." Both Ray and Petiver referred to Kamel as "the learned Jesuit, well skilled in Botanics, a virtuoso of Botany."

Kamel's labors were so heavy that in 1705 the college rector gave him three lay assistants, one as an apprentice in the pharmacy itself, the other two to help take care "of the garden which Brother Kamel had planted, consisting entirely of rare and medicinal herbs."

By some later-day scientists Kamel was discountenanced and considered an amateur, an inaccurate observer. This judgment was based on misunderstood and unfortunate facts. Those who blaze trails are censured, for they depart from the usual; they are innovators, nonconformists. Only time shows them in their true perspective. None of Kamel's writings were published by himself. Not self-seeking, he pushed others forward and remained in the background, his name hidden. What he accomplished was done under the most unfavorable conditions, when he was shackled with other duties. Some of his studies were lost, others delayed. One communication to scientist-friends in England was more than three years in transit. His judgments and reports were made according to the scientific classifications of that day and would need revision today, a revision which modern scientists would not find difficult because of the clarity of Kamel's descriptions. The mistakes he made were the errors of the science of his day. Actually, he rose above the contemporary level in many respects. His detractors had access only to his published notes, not his drawings. Those who had access to both esteemed him greatly.

Kamel died early. If he had lived, his work would have been collected and kept intact, not scattered and published piecemeal. On such accidents of fate rest a man's name and fame!

So much did the great Swedish botanist, Linnaeus, admire the humble Jesuit that he named the Oriental plant *Thea japonica* after him. Henceforth, it bore the Latinized version of Kamel's name and was called *Camellia.* Kamel, who died one year before Linnaeus was born (1707), never sent a picture or description of the camellia to anyone in Europe, not a living plant or specimen. It is doubtful that he ever saw one, for the camellia is not adapted to Manila gardens.

The intriguing plant with its glossy, evergreen leaves and snowy white or many-shaded pink, red, and variegated blossoms, excited Linnaeus. He found it beguiling to the end of his days.

Today camellias adorn many gardens where climate and soil sustain them, and camellia enthusiasts in "off-limit" areas cherish them in hothouse and conservatory. Experimentation and improved methods have produced plentiful and even more beautiful varieties.

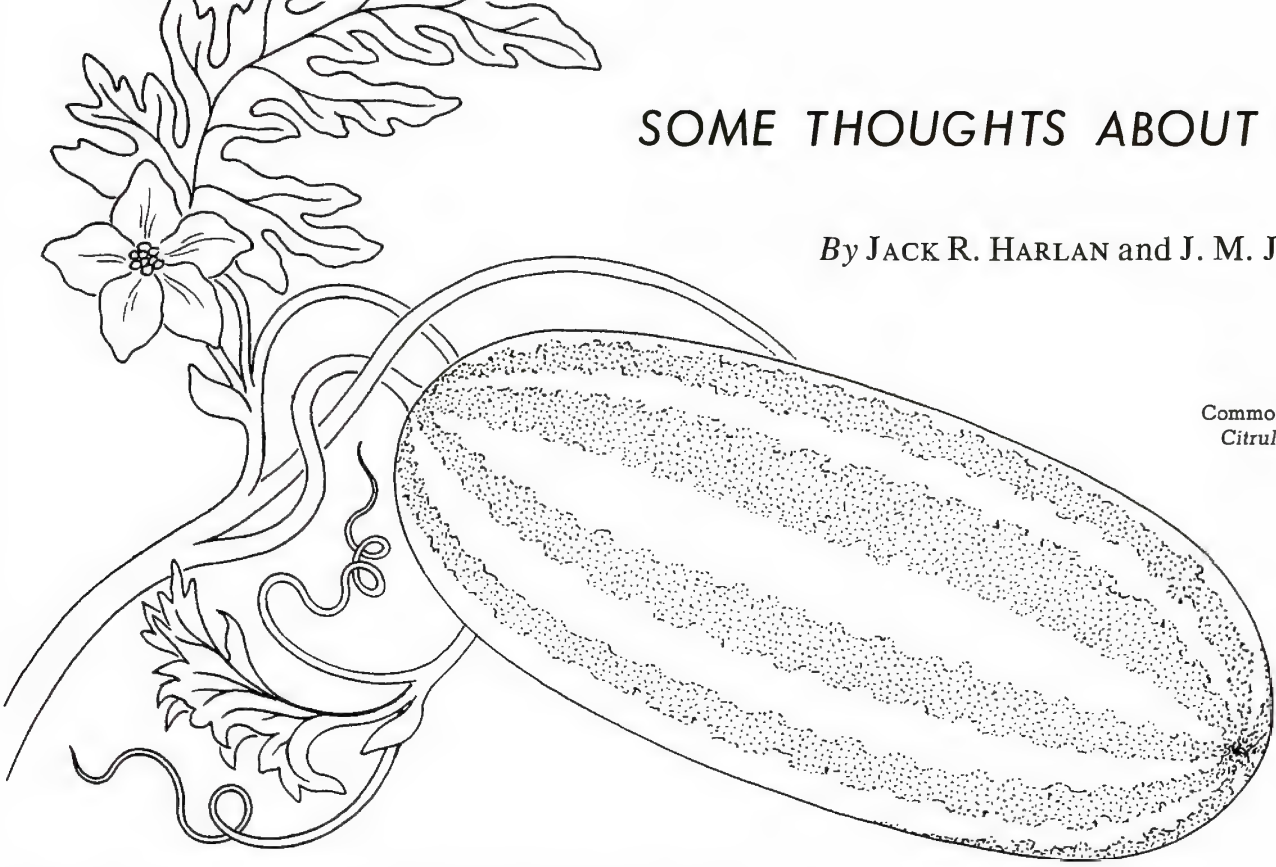
The Oriental camellia was first heard of in Europe in 1640 when Englehart Kampfer, Chief Sergeant of the Dutch East India Company, brought a plant from Nagasaki, Japan. The plant, which originated in China, was commercialized by the Japanese. Ship captains and seamen, doctors, merchants, and missionaries brought back seeds and plants. France and Italy were the principal markets. A single-flowered camellia, planted in Caserta, Italy, in 1760, had attained a height of fifty feet by 1843 and was regarded as a tree. The publication of Alexandre Dumas's romantic novel, *Lady of the Camellias,* in the mid-nineteenth century stimulated general interest in the puzzling plant.

It was in the mid-eighteenth century that camellias were successfully planted outdoors in this country. Conflicting stories abound. One relates that the first camellias arrived in the United States from Belgium in 1790 and were consigned to Savannah, Georgia, but were refused because of damage in shipment. They were purchased by Dr. Charles Shepard at the Tea Farm in Summerville, South Carolina. Another account relates that the first four camellias planted in America were brought from France to the Middleton Garden at Charleston, South Carolina, by the celebrated botanist André Michaux around 1783. Three of these first four camellias are still blossoming at Middleton. The Charleston garden is said to have the tallest and largest camellia "trees" in the nation.

Camellias were transmitted to the West Coast by traders directly from the Orient. They were first grown in greenhouses, but later camellia gardens were developed. Today camellia shows, at which an Oriental atmosphere prevails, are held annually in many western and southern cities. All camellias, from the modest, old-time plant to the floriferous recent varieties, speak eloquently for self-effacing Georg Joseph Kamel. For him the camellias bloom.

SOME THOUGHTS ABOUT WEEDS

By JACK R. HARLAN and J. M. J. DEWET



Common watermelon, *Citrullus vulgaris.*

The senior author is in the Department of Agronomy, the junior author in the Department of Botany and Plant Pathology, Oklahoma State University at Stillwater.

The following has been excerpted from the article under this title which was published in *Economic Botany,* Vol. 19, No. 1, January-March, 1965, with permission of *Economic Botany* and the authors.

WHAT IS A WEED?

THE WORD "WEED" comes to us from Middle English and has Flemish, Frisian, and Anglo-Saxon roots. . . The word appears in English literature at least by the time of Alfred in the ninth century. The early usage appears to be compatible with the first definition given by the *Oxford English Dictionary:* "Weed 1. A herbaceous plant not valued for use or beauty, growing wild and rank, and regarded as cumbering the ground or hindering the growth of superior vegetation." It should be pointed out that "weed" meaning clothing, garb, armour, or covering (e.g., "widow's weeds") comes from Teutonic and Scandinavian roots.

The first definition given by the OED has been satisfactory until recent times. Metaphorically, weed has been used for tobacco, for horses which might well be culled from the herd, and spindly or ungainly people; but, on the whole, usage of the word has been in conformity to the definition. In recent decades, however, the words—"weedy," "weed," "weediness" or "weedishness"—have taken on fresh implications which have not been adequately discussed nor critically defined in published form.

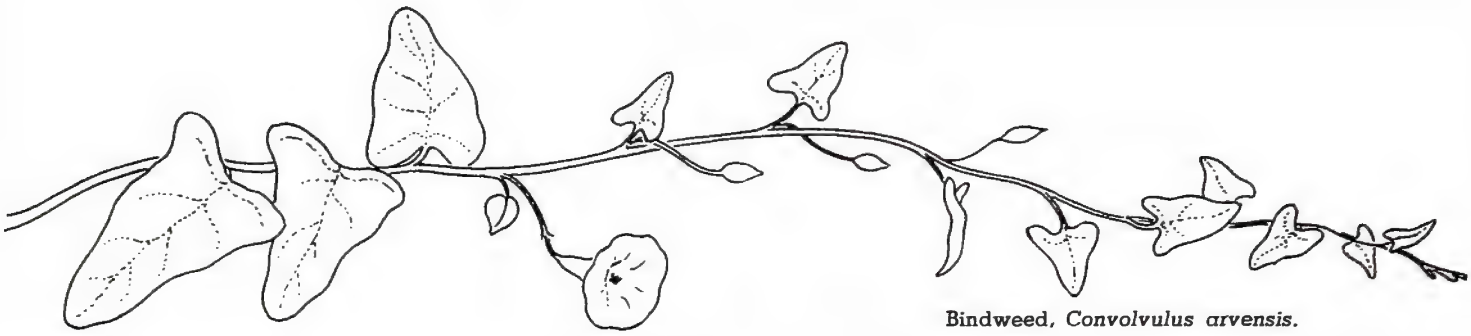
A WEED IS UNWANTED

The first ten definitions in Table 1 are by professional weed men. Obviously, they are in agreement and have either copied their definitions from each other or from the same dictionaries. It is, perhaps, understandable that the professional weed men should emphasize the unwanted aspect of weeds; their bread is buttered by the undesirability or "unwantedness" of weeds.

We agree that weeds are generally unwanted, but we cannot agree that this should be the ultimate criterion for calling something a weed. The professional weed men are inconsistent on this point. In each of the cases cited, the author, having defined a weed as a plant out of place or an unwanted plant, then proceeds to give long lists of "weeds" as though weeds were species. They also frequently speak of the qualities of "weediness" or "weedy habits," and in no case are they referring to a degree of unwantedness. Despite the sameness of the definitions, it is evident from the usage of the word that a weed is a weed because of something it is or does and not simply because it is an object of prejudice.

Some thirty years ago, the combination of a severe economic depression and a protracted, intensive drought caused extensive abandonment of farmlands throughout the Great Plains. In the first or second year of abandonment, thousands upon thousands of acres were covered with solid stands of either Russian thistle or weed sunflower. These two species, the one alien, the other native, are on everyone's weed list. But did these plants suddenly lose their status as weeds when the farms were abandoned? On the day of abandonment did these plants become something else because there was no one there to not want them? But in fact, these and other species in similiar situations suddenly became very valuable plants by covering the soil and reducing wind and water erosion on abandoned fields. Yet we submit that most people would still call them weeds.

It is our contention that whether man wanted them or not had little to do with it. The Russian thistle and the



Bindweed, *Convolvulus arvensis.*

weed sunflower are weeds primarily because of the habitats they occupy, and man's attitude toward them is secondary. Bunting (1960) challenges the current definitions in these words:

"The common definition of a weed—that is, a plant in the wrong place—conceals two important implications. Firstly, the word 'wrong' implies a human opinion, since right and wrong are human concepts not inherent in nature. Secondly, the word 'place' implies some characteristic dependence on environment, or in other words an ecological relationship, and clearly that relationships has to do with man's own botanical activities in farming."

He then defines weeds in ecological terms as "pioneers of secondary succession" (Table 1-C). The use of the adjective "weedy" clearly reveals that we have defined "weed" one way but use it another. For example, Bunting (1960) states: "In parts of West Africa, the weedy *Digitaria exilis* is an important crop." But "weedy" only incidentally has anything to do with wantedness or unwantedness. It has to do with ecological behavior.

There are, then, two traditions with respect to weeds: one based on ecological behavior and one on man's response to the species in question. As might be expected of biological materials, neither criterion is sharp nor clear-cut.

One difficulty in using the test of "unwantedness" to define a weed is that one man's weed is often another man's crop. The wild oat may be a serious pest to the California wheat grower; but to the cattlemen of the coast and foothill ranges, the wild oat may be his most important forage. Johnson grass may be a hated weed to the Texas cotton farmer, but a valuable hay crop to his neighbor. The weedy watermelon, *Citrullus vulgaris,* is an obnoxious weed in cultivated fields over much of tropical and subtropical Africa, but it is often the only supply of water for man and beast alike in the Kalahari Desert (Story 1958). A man may fight *Cynodon dactylon* with a passion in one field, deliberately plant an improved variety in another field, and nurture still another variety with tender care about his house. On the whole, it must be admitted that the human response is more capricious than inherent ecological behavior.

A Weed is Adapted to "Disturbed" Habitats

Those who think of a weed in ecological terms generally agree that weeds are adapted to "disturbed" or unstable habitats. By this we generally mean pioneers of secondary succession, but it is pertinent to establish the kinds of disturbances and the causes of instability which are applicable. In the absence of man, unstable habitats may be rather rare. We can think of river banks and frequently flooded areas, the shores of lakes, seas, and oceans, active dunes, areas unstable because of wind or water erosion, land slips, talus slopes, steep cliffs, land vacated by retreating glaciers, and the like. We would also have to consider species which temporarily occupy land after fires in forest, woodlands, and

TABLE 1. Definitions of Weeds

A. By Professional Weed Men		
Blatchley	1912	"a plant out of place, or growing where it is not wanted."
Georgia	1916	"a plant that is growing where it is desired that something else shall grow."
Robbins et al.	1942	"these obnoxious plants are known as weeds."
Fogg	1945	"any plant which grows where it is not wanted."
Muenscher	1946	"those plants with harmful or objectionable habits or characteristics which grow where they are not wanted, usually in places where it is desired that something else should grow."
Harper	1960	"higher plants which are a nuisance."
Isely	1960	"any plant where it is not wanted, particularly where man is attempting to grow something else."
Salisbury	1961	"a plant growing where we do not want it."
Klingman	1961	"a plant growing where it is not desired; or a plant out of place."
Wodehouse	1963	"an unwanted plant."
B. By Enthusiastic Amateurs		
Emerson (in Blatchley)	1912	"a plant whose virtues have not yet been discoverd."
Cocannouer	1950	"—This thing of considering all weeds as bad is nonsensical!"
King	1951	"weeds have always been condemned without a fair trial."
C. By the Ecologically Minded		
Bunting	1960	"weeds are pioneers of secondary succession, of which the weedy arable field is a special case."
Anderson	1953	"artifacts," "camp followers."
Blatchley	1912	"a plant which contests with man for the possession of the soil."
Dayton	1950	"introduced plant species which take possession of cultivated or fallow fields and pastures."
Pritchard	1960	"opportunistic species that follow human disturbance of the habitat."
Isely	1960	"the prime characteristic possessed by all important weeds is their ability to thrive in land subject to the plow."
Salisbury	1961	"the cosmopolitan character of many weeds is perhaps a tribute both to the ubiquity of man's modification of environment conditions and his efficiency as an agent of dispersal."

grasslands. Many forest floras include plants which temporarily exploit openings caused by blowdowns. Then there are pyro-climax species which establish themselves more or less permanently as long as the area is burned occasionally, but which might eventually disappear in the total absence of fire. Finally, animals other than man may cause wide-scale "disturbance," such as overgrazing by herbivores, traffic on game trails, trampling near water holes and bedding grounds, the rooting habits of some species, the burrowing habits of others, the migrations in vast numbers of a few gregarious species, the work of termites, ants, locusts, and so on.

But are these the kinds of disturbances we really have in mind? Are plants adapted to such situations what we really think of as weeds? By the test of unwantedness, there can be no weed in the absence of man. Ecologically, we suggest that man is equally necessary for weeds to be weeds. There is something biologically intimate about man and true weeds. A weed might, then, be defined as a generally unwanted organism which thrives in habitats disturbed by man. To a greater or lesser extent, man takes his habitat with him wherever he goes. Species adapted to this habitat are either weeds or domesticated species. The chief difference between the weeds and the domesticates is in man's attitude toward them and in his response to them. In general, man wants the domesticated species and tries by various means to encourage them; and, in general, man does not want the weeds and tries by various means to eradicate them. However, since both are adapted to the same habitat, practices which tend to favor domesticates also tend to favor weeds.

When we specify *human* disturbances, we emphasize the extremely close relationship between weeds and man and probably would not exclude any significant organisms adapted to nonhuman disturbances. By this approach, if a species is "weedy," it is well adapted to some niche in the human habitat. "'Weediness" refers to an adaptive syndrome which permits a species or variety to thrive and become abundant and difficult to eradicate within areas of human disturbance.

Crop-Weed Complexes

By our definition, there were no weeds before man; but, according to one theory of plant domestication, there must have been weeds before agriculture. The theory of the weed-origin of crop plants goes as follows: (1) man disturbs an area, (2) the weeds move into the disturbed area, (3) man finds something useful in the weed to harvest, and (4) he learns to disturb (cultivate) the land on purpose in order to reap a better harvest from the weed now turned into a crop. The original disturbance may have been caused by herding livestock or simply by living in one place a long time and thus establishing middens, paths, refuse heaps, and the like. This "dump heap" origin of agriculture has had a number of supporters and may, indeed, have been one of the routes to plant domestication. (Sauer, 1950, Anderson, 1952).

N. I. Vavilov (1926) made a less radical proposal with respect to secondary crops. He did not claim to know how primary crops were domesticated, but felt that once they had been established as successful domesticates, they would inevitably provide habitats in which weeds would grow. Some of these weeds became so well adapted to the conditions of cultivation that they attracted the attenion of primitive plant breeders and in due time became crops themselves. Rye and oats were given as examples of secondary crops.

Left. Bermuda-grass, *Cynodon dactylon.*
Right. Darnel, *Lolium temulentum.*

Opuntia sp.

Actually, many of our crops have weed forms. There are weed potatoes, weed peppers, weed sunflowers, weed carrots, watermelons, wheats, barleys, rices, oats, and many others. Perhaps most cultivated plants have one or more companion weed forms. Generally, the weed forms are not more primitive than the crop and frequently show such a degree of morphological, cytogenetical, and ecological specialization that they could not possibly be progenitors of the crops to which they are related. The sequence of wild plant adapted to naturally disturbed habitats to weed adapted to man-made disturbance to domesticated crop usually will not hold up under morphological and cytogenetical analysis.

The weed-origin theory of crop plants fails to take into account the fact that weeds can evolve just as much as crops. Thus, when we seek progenitors, we must look for species which could give rise to both the weed form and the crop form together. The progenitor of barley must also have given rise to *Hordeum spontaneum,* the progenitor of rice must have given rise to *Oryza sativa* var. *fatua* as well as to *O. sativa.* The weeds in our fields today may be as far removed from the wild as their companion crops.

The sequence, then, is more likely to be from wild plant adapted to naturally disturbed habitats to a crop-weed complex. The bifurcation into a crop and companion weed form may have occurred at the start of domestication, or the weed form may have developed considerably later than the crop. Some degree of introgression between the crop and weed forms seems to be characteristic of most crop-weed complexes. In such cases, the weeds have played important roles as reservoirs of germ plasm in the evolution of the crops. The present relationship between Mexican maize and teosinte is an outstanding example of this type of crop-weed complex.

Degrees of Weediness

Whether weeds preceded crops, developed along with them, or came later as specialized ecotypes, they have surely changed since the dawn of agriculture. Just as surely are there degrees of weediness among different species and races of the numerous plants called weeds. Some species are only mildly weedy; others are so completely adapted to the haunts of man that they are obligate weeds and could not exist if man ceased to prepare a habitat for them. Some species are a part of the naturally developed flora of undisturbed areas in one region and noxious and pernicious weeds in other regions. For the most part, however, plants which are really weeds show their weedy tendencies wherever they are adapted.

Species of *Opuntia,* for example, are a part of the natural vegetation of the warmer and drier parts of the Americas. They have escaped as serious pests in Australia, Africa, and parts of Asia, and can be weeds in America, too; some of them respond to overgrazing and abuse of rangelands by spectacular increases in population and density. Weeds can therefore be classified in the categories of "obligate" and "faculative." The *Opuntia* spp. are facultative weeds.

Zohary (1962) lists such species as *Lolium temulentum, Convolvulus arvensis,* and *Phalaris paradoxa* as obligate weeds and states that some of them are anecophytes, that is, "plants whose original habitat is unknown. They, therefore, closely resemble many of the cultivated plants which have not been found anywhere in the wild state." Facultative weeds occur in both cultivated and primary habitats. They include amphioecious plants with wide ecological ranges extending from the cultivated field to "wild" habitats and pseudoamphioecious plants which are primarily adapted to cultivation but can penetrate into primary habitats under temporary human influence.

Categories of Weeds

Weeds have been classified in various ways. They have been classified according to life cycle as annuals,

Canada thistle, *Cirsium arvense.*

perennials, biennials. They have been classified according to the places in which they grow—cultivated fields, waste places, pastures, and so forth. They can be classified according to the degree of unwantedness, as tolerable, noxious, damnable. More pertinent to this discussion would be a classification according to the adaptations which make weeds "weedy."

Many weeds produce prodigious numbers of seeds, and these seeds have special adaptations which prevent all of them from germinating at once. The seeds are often small, very numerous, and capable of lying dormant in the soil for long periods of time. The dormancy may be due to special adaptations and may be broken in various ways. Some seeds are sensitive to light and, when buried during tillage, may remain viable for a number of years. When the soil is turned again, some are brought to the surface and sprout. Other seeds have a cold requirement, still others contain inhibitors which break down with time or can be leached out. Some seeds are stimulated by specific chemicals, and some do not germinate except in the presence of certain plants. Perhaps most of the annual weeds have an adaptation syndrome involving the production of enormous numbers of seeds with special mechanisms so they will not all sprout at once.

Adaptive mechanisms of this kind are not confined to weeds, however. These are the kinds of mechanisms which adapt plants to short-life cycles. Desert ephemerals have the same adaptations without necessarily being "weedy."

Another adaptation syndrome is one in which the weed mimics the crop sufficiently well that the seed is harvested with the crop and sown with it at the next planting season. *Camelina nativa* subsp. *linicola* is a well-known example in which races have developed resembling particular varieties of flax in stature, posture, and maturity, as well as in seed size and weight (Tedin 1925, Stebbins, 1950). Zohary (1962) cites races of *Bromus secalinus* which retain their spikelike panicles intact at maturity, unlike its congeneric species. This insures that the weed will be harvested with the cultivated *Secale* with which it commonly grows as a weed. The difficulty of separating *Lolium temulentum* from *Triticum* spp. is well known from Biblical times. In the United States and many other countries, extensive seed-control organizations have been set up to restrict or prevent the sale and shipment of crop seeds which are heavily contaminated with weed seeds. Nevertheless, the transport of weed-infested stock seed is one of the principal means of weed dissemination.

Among perennials, most of the adaptations for weediness concern longevity. Some have rhizomes, such as *Cynodon dactylon, Agropyrom repens,* and *Sorghum halepense*. Others, such as Canada thistle, bull nettle, and bindweed, have deep tap roots which are difficult to kill by tillage. Many have deep buds which can sprout from below the plow line. Other perennials are woody root-sprouters which are not killed by simply cutting them down or by burning. Some of the more objectionable weeds combine qualities of persistence with other noxious features, such as thorns, stinging hairs, poisonous principles, and the like. There are also some which reproduce in great abundance, as among the annuals.

Whatever the adaptations may be, simple or elaborate, they tend to fit the weed to a particular part of the human habitat, frequently with such success that they cost dearly in control measures. It is frequently tempting to try to transfer some of these adaptive features to cultivated plants; and in attempting to develop new forage plants, it has been found much easier to work with species which have somewhat weedy characteristics than to work with nonweedy ones.

Where Do Weeds Come From?

Weeds have come from two main sources: (1) wild species which have long been adapted to sites of natural disturbance, and (2) new species or varieties which have evolved since agriculture was developed. Before agriculture, the most wide-scale disturbance was caused by Pleistocene glaciation. Most of Europe and great sections of North America were alternately covered and exposed. Pioneer habitats were made available on a vast scale, with ample time for species adapted to such habitats to evolve. Thus, in temperature areas around the world, the chief weeds are Eurasian and North American species which developed in or near the areas of disturbance caused by Pleistocene glaciation.

But the Pleistocene disturbance was not nearly so vast nor so rapid as that caused by man after the invention of successful forms of agriculture. There is now hardly a place anywhere on earth untouched by man in some way. Some weedy species might have been rather uncommon before man started to churn up the landscape; but when the agricultural revolution reached them, their ecological niches were suddenly expanded and they prospered enormously.

Godwin (1960) traced the history of weeds in Britain by palynological methods. He reported some of the species to be present in interglacial times and, therefore, could hardly have been man-made artifacts. But it is usually not possible to tell a wild form from a weed form by the pollen. The later pollen cores clearly recorded the arrival of neolithic farmers by a dramatic decrease in the proportion of tree pollen and an equally dramatic increase in weed and cereal pollen. Some of the weeds could easily have doubled as crops, for, as Godwin put it: "the distinction between crop and weed was formerly less obvious than now."

Most of our modern weeds and, presumably, all our obligate weeds did not exist in their present form before agriculture. They are new products of evolution. They are dynamic and labile and constitute excellent subjects for the experimental study of evolution. They are products of vast disturbances on a continental scale, where whole floras have been uprooted and replaced by imported floras and where great masses of plants which have been separated for great periods of time, are suddenly brought together under conditions promoting mass hybridization. Such a global disturbance has probably never occurred before; the result has been the evolution of new plants adapted to the new ecological niches.

(Continued on page 196)

CONVERSATIONS ON ECOLOGY XVI

Robert H. Boyle, who contributes the third article in this second series of "Conversations on Ecology," is a Senior Editor for *Sports Illustrated Magazine*. An ardent conservationist, a resident of Croton-on-Hudson, New York, a prolific writer, and outspoken critic of the mass exploitation of our natural resources, Mr. Boyle is currently writing a book dealing with the natural history of the Hudson River. A feature article of his appearing in the November 16, 1964, issue of *Sports Illustrated,* titled "America down the Drain," drew nationwide attention to the problem of the continued rape of our landscape. His wide contacts with a variety of conservation agencies and organizations, both private and governmental, make Mr. Boyle an ideal contributor to this continuing series on the related roles of ecology and conservation.

Finney Farm
Croton-On-Hudson
New York
June 13, 1966

Dear Dr. Dansereau:

I have read the continuing "Conversations on Ecology" with a rising sense of excitement and expectation. Much of what has been said so far gives me, a layman, a journalist, a "conservationist," great cheer. I am particularly pleased that you and Frank Egler argue that ecologists should make themselves heard on issues. It is about time. As one who has taken part in a couple of hot conservation fights, I must say I have gotten rather annoyed at scientists sitting silently on the sidelines, as though they were at a deaf and dumb tennis match, watching justifiably concerned citizens trade volleys with utility company executives, highway engineers, and other wreckers of the environment. But enough of this. Welcome to the field of battle. You give me the sort of lift that the British must have felt when they heard the United States had entered the war.

My own interest in conservation stems from fishing. I am not a joiner by nature, but in order to be able to fish, I have to join with others to protect rivers, wetlands, ponds, lakes, estuaries, oceans, etc., from despoilment. Frankly, this is a tiresome business. A conservation fight, such as the Storm King power project, takes time, often pots of money and, in my case at least, an emotional toll. I have, I suspect, become a bore on the subject of fish in particular and conservation in general, and old friends now cross to the other side of the street when they see me. But the devil with them. I have no intention of letting fish be destroyed by plunderers marching with placards mislabeled "Progress" or politicians oozing pieties about "multiple use."

I wish I could lay claim for my feelings to the writings of Thoreau or Aldo Leopold, but although both gentlemen have been helpful, I must say I simply like fish and the waters in which they are found. I have no qualms about impaling a minnow on a hook as bait for a smallmouth bass *(Micropterus dolomieu),* but I do not regard myself as a hunter, a "meat fisherman," whose appetite must be satisfied at all costs. Some of my best days have occurred when I didn't catch a thing. In fact, I can lose myself staring at a dragonfly skimming and darting over the surface, its chitinous exoskeleton glistening and sparkling in the sunlight. I can waste countless hours just thinking about largemouth bass *(Micropterus salmoides)* moving about a certain Croton pond or huge striped bass *(Roccus saxatilis)* lurking, so I imagine, in the deep hole in the Hudson off Stony Point. I am drawn to fish because they are to me a great part of the real world, a world I do not want to see sacked. Undoubtedly, many fishermen feel the same way.

I don't want to issue a blanket indictment against all politicians. There are some excellent men who are very much concerned about the environment, men such as Congressmen John Dingell and Richard Ottinger and Watson Pomeroy, a New York State Senator who is resigning his seat to run as a delegate for the Constitutional Convention, where the forest preserves are due to come under attack. By contrast, I am depressed by the activities of others who are engaged, I feel, in what can only be called "cosmetics conservation," the school of thought that adjures us all not to litter highways but blithely paves over trout streams, such as the Beaver kill and the Willowemoc, so members of the Teamster's Union can enjoy the view. By prettifying, by giving the public a sense of false security, the cosmetics conservationists obscure the ecological aspects of an issue, and they thus are often more of a problem than the worst laggards in the State Legislature or Congress. (Laggard politicians can be handled, if conservationists will act. Alas, there are some gentle souls who don't want conservation "mixed up in politics." I couldn't disagree more. Conservation belongs in the pit of politics, because that is where fights are won or lost. And I think most fights will be won because the public has become concerned. Indeed, conservation already is the civil rights of exurbia.)

In the past few years, I have been involved with perhaps a dozen conservation organizations. Here are some comments of those organizations with an ecological orientation.

NATIONAL AUDUBON. A bit birdsie for my taste, but I cannot visit my taste upon everyone, and besides there are many persons who would never become involved in conservation were they not initially attracted by Robin Red Breast and his friends in Purple Martin Manor. In general, Audubon does a good job in educating the public at large, especially the young, to an awareness of nature, but the society has yet to realize its potential impact nationally. Local branches vary. The branch to which I belong, Saw Mill River Audubon Society, is excellent. Its members are informed, articulate, and active. Saw Mill runs three sanctuaries, and at one of them, Brinton Brook, Dr. James Alexander, a chemical oceanographer, is doing extensive research on fresh water ecology. Members of the society itself are doing re-

search on other aspects of the sanctuary, and we hope that within a few years we shall be able to come up with a definitive, informative book. This sanctuary, by the way, was gotten for Audubon by Richard Pough who quietly works behind the scenes for the Nature Conservancy and the Open Space Action Committee. If conservation had a few more Poughs, we would have far fewer fights to wage. Pough is about ten years ahead of the land wreckers, and he knows what is choice and important.

Sierra Club. This is undoubtedly the most effective national conservation organization, and that, in good part, is because it is led by David Brower who has courage, imagination, and taste. Brower is to be credited, for instance, for the club's magnificent books, possibly the finest published in the world regardless of subject. In a way, it is a tribute to the Sierra Club's effectiveness that the Internal Revenue Service recently suspended the club's tax exempt status because of newspaper advertisements attacking legislation authorizing dams in the Grand Canyon. Anyone familiar with the numerous activities of the club knows that it does not devote a "substantial part" of its resources to influencing legislation, and I suspect that the IRS action was prompted by some bureaucrat who feared the club's increasing influence on national conservation issues. In any event, it does strike me as unfair that a non-profit conservation organization should be prohibited from devoting a substantial part of its resources to influencing legislation, especially when you consider that there are no similar handcuffs on the lobbying activities of, say, the Bureau of Reclamation which can spend taxpayers' money lavishly to brainwash the taxpayers.

Scenic Hudson Preservation Conference. This group started a few years ago in opposition to the Consolidated Edison Company's proposed pumped storage hydroelectric plant at Storm King mountain on the Hudson. We were told we didn't have a prayer, but last December, the United States Court of Appeals in New York unanimously set aside the Federal Power Commission's license for the plant in a landmark conservation decision. Ecological factors played a strong part in that decision. Scenic Hudson began with a couple of dozen people floating in and out of meetings, but for the past year and a half we have had a most energetic and brilliant executive director, Rod Vandivert, a former advertising man who found his conservation interests and activities so overwhelming and compelling that he gave up Madison Avenue. (Richard Pough introduced Vandivert to Scenic Hudson; perhaps a future letter under "'Conversations on Ecology" should deal with the possible existence of a "Conservation Establishment.") Vandivert got active in conservation the hard way, fighting to save the wetlands on Long Island. He once told a Congressional committee that he had become involved originally when the Army Corps of Engineers was about to obliterate his backyard, a bay on the Atlantic.

American Littoral Society. Scholarly, educational, not militant. Emphasis on marine ecology. The society publishes a quarterly bulletin and is conducting an extensive fish-tagging program. Anyone interested in underwater life should join. A great clearing house for information and ideas, with many active members whose idea of joy is to sit on the bottom of the Atlantic watching striped bass feed.

Long Island League of Salt Water Sportsmen. An aggressive group of approximately eleven thousand members, most of whom flail away at the surf for striped bass. When I first got in touch with the League, one outdoor writer warned me against it. "Fanatics," he said. Bosh, I say after seeing the League and Don Manns, its guiding spirit, at work. The League has to be militant because state officials up in Albany could not care less about marine and anadromous fish. If it were not for the League and Dom Pirone, its consulting biologist (and a student of yours), the slaughter of striped bass by the ton at Con Ed's Indian Point nuclear plant on the Hudson would have gone unnoticed. As it was, state officials did their best to hush up the kill, and they also denied having pictures of the carnage. Even when a Congressional committee aired the mess and produced pictures, the then Conservation Commissioner excused the slaughter as "almost in the vein of an act of God," a statement so outrageous I am prompted to leave the ecologists to join with theologists to ask, "Is God dead?"

The Hudson River Fishermen's Association. This is a new organization dedicated to what one might call "do-it-yourself-ecology." Membership is open to anyone who wishes to apply (sports and commercial fishermen are particularly welcome), dues are low ($2 a year), and the association's interest in aquatic life in the Hudson Watershed runs from the Adirondacks to the harbor mouth. So far, members have tagged about seventy-five striped bass in the river, with the hope of getting that number up to at least five hundred by the end of this year. This August and September, members are also planning to tag bluefish *(Pomatomus saltatrix)* which, to the surprise of marine biologists, run up the Hudson as far north as Bear Mountain and possibly beyond. The Association publishes an informal news bulletin on happenings in the Hudson and holds meetings about every three or four months. These meetings are on a high level. This fall, for instance, we hope to present the gubernatorial candidates and have them speak on conservation matters in the state. At the first meeting last March, Representative Ottinger spoke on pending river legislation, and Dr. James Alexander, a director of the Association, lectured on the aquatic food chain. If Alexander's talk demonstrated one thing, it was that scientists need not fear that they will "bore" the man in the street by using ecological terminology. The fishermen in attendance—and this was a standing-room only audience—lapped up all they could about phytoplankton and zooplankton, and they are eager for more. I am most optimistic about the Association. It is now pressing for a basic ecological study of the lower river from Newburgh down. Incidentally, Ron Dagon, your research assistant, is one of its directors. Another director is Irving Younger, an associate professor of law at New York University and a former Assistant United States

Attorney. (If you can get a good lawyer in a conservation organization, it helps a lot.)

With this, I'll leave you. I have, perhaps, been blunt, but blunt talk is necessary. If the ecologists are willing to come out from behind the bushes, I expect they'll find the general public most receptive. The fishermen I can guarantee.

Very truly yours,
ROBERT H. BOYLE

ABOUT WEEDS (Continued from page 193)

We may conclude from the distribution of crops and weeds among the flowering plants that weedy adaptations have evolved many times independently, but that only a relatively few species were found suitable for domestication. All the large and diverse families have contributed weeds (*Orchidaceae,* perhaps, excepted), but some have contributed only a few domesticates. On the other hand, a few of the smaller families have contributed important crop plants plus a modest complement of weeds. The great number of weeds and their wide distribution through the Angiosperms suggests that the adaptations and specializations required for weediness are under relatively simple genetic control.

On cultivated land, we obligingly provide an open, clean seed bed for the weeds to grow in year after year. When we stop providing the seed beds and allow succession to proceed, the weeds disappear. It would seem that the adaptations required for survival in climax vegetation would be far more complex and elegant than those permitting species to flourish under human disturbance.

PACKAGED SUNSHINE (Continued from page 178)

ing-off fungi. This should be guarded against by using one of the many seed-sterilizing chemicals on the market. Sterilized soil is also recommended.

There are a number of books for the home gardener on the artificial lighting of plants. Several of them are quite good, but most of them are weak on the theoretical reasons for the choice of lamps, timing, and so on. The following can be recommended at least as regards the design of installations and good advice on horticultural practice: Cherry, E. *Fluorescent Light Gardening,* Van Nostrand & Co., Princeton, N. J. (1965); Kranz, F. H. & J. L. Kranz. *Gardening Indoors Under Lights,* Viking Press, N. Y. (1957); and Schulz, Peggy. *Growing Plants Under Artificial Light,* M. Barrows & Co., N. Y. (1955).

In addition, several very informative brochures have been published by lamp manufacturers and by the United States Department of Agriculture. The commercial publications can be obtained by writing to the appropriate company. The government publications can be purchased from the Superintendents of Documents, Government Printing Office, Washington, D. C.

U.S.D.A. PUBLICATIONS

Cathey, Henry M.: Indoor Garden for Decorative Plants. June 1965.

Cathey, Henry M.: Growing Flowering Annuals. Home & Garden Bull. 91, January 1965.

Anon.: Plant Propagation with Artificial Light. C. A.-34-76. October 1962.

Downs, R. J. et al.: Light and Plants. U.S.D.A. Misc. Publ. 879. 1961.

Anon.: New Light on Plants. U.S.D.A. Agr. Res. 1953.

COMMERCIAL PUBLICATIONS

Plant Growth Lighting. Bull. TP-127. General Electric Co.

Light for Plant Growth. Bull. L.S.-168. General Electric Co.

Outdoor Lighting for Family Living. Bull. LS-171-R. General Electric Co.

Gro-Lux Bulletins. FL-676-11/62; FL-716-8/64; GRO-50M-LH; Engineering Bull. 0-294. Sylvania Corp.

New Plant-Gro Fluorescent Lamp. Westinghouse Electric Corp.

This article does not attempt to cover any of the manifold problems of the horticultural care of plants grown under artificial illumination. There is an old but true saying that plant physiologists can't grow plants; they just know how to kill them. Good horticultural practice is learned by experience and by the reading of the many fine books on gardening.

At this point, I bow out.

CYPRIPEDIUM REGINAE (Continued from page 182)

stage setting the details of the foreground coalesced in the distance to a watery green haze.

Arranged like a corps de ballet were the orchids—solid clumps of fifty or more plants each, some with buds just ready to open, most showing one or two flowers. And there were at least ten of these groups.

Such a ground cover retains the slightest marks of disturbance, so it was evident no one had preceded us that year, though people were living and working the fields only a few yards away.

I suppose that this place in northern New York will not long survive, since beauty seems unable to withstand the onslaughts of convenience. Pollution will destroy the plants, if they are not bulldozed out of the way. I believe we should make a special effort to save *C. reginae.* We should cherish it as our heritage and that of our children.

From their home in Armonk, New York —French Provincial style adapted to modern American family life— Mr. and Mrs. John C. Sluder enjoy a beautiful scene—part of the New York City watershed and the low hills surrounding Kensico Reservoir. The swimming pool and the plantings around it of mugo pine, potentilla, *Forsythia viridissima bronxensis*, Sargent and Wilton junipers, *Cotoneaster horizontalis*, bayberry, inkberry (*Ilex glabra*), and native sweet fern (*Comptonia peregrina*) are recent additions. Charles Middeleer was responsible for this planting.

The garden at the left of the house is enclosed within a fence on which grow climbing roses and *Clematis montana rubens*. The air is scented with the delicious fragrance of *Viburnum carlesi*.

1966 SPRING GARDEN TOUR

Sponsored by Women's Council of The New York Botanical Garden

Photographs by Walter Singer

Tour participants return from the terrace in front of "Cross River House," from which they enjoyed looking at the broad lawn, bordered by rhododendrons and yellow root (*Xanthorhiza simplicissima*), and, beyond, the Cross River Reservoir.
"Cross River House" was built by Mr. and Mrs. Paul Sturtevant on "the Judge Jay Wood Lot," part of a parcel of land bought from the Indians in 1700 and inherited by John Jay, first Chief Justice of the United States Supreme Court, from his grandfather Jacobus Ian Cortlandt in 1703.
The gardens, designed by Clarence Fowler, landscape architect, include a rose garden, a sunken garden of white azaleas, a perennial border, and a "blue walk."

Vine-covered archway, with a rose-patterned wrought-iron gate, leads to the rose garden at "Bedford Honour."

Along the "blue walk" at "Cross River House" in Katonah, New York, blue-flowering plants are accented by yellow pansies.

"Oaklands," the residence of Mr. and Mrs. Harry W. Fowler at Katonah, New York, was built of local stone, mostly from old stone walls on the property, in the French style. Robert Ludlow Fowler was the landscape architect for the grounds and garden.

To the right of the lawn on the west side of the house, on a lower level backed by a stone retaining wall, is a long border of spring bulbs, seasonal perennials, and such shrubs as azaleas, heathers, lavender, roses, bayberry, and viburnums.

At the far end of this border is an expanse of lawn from which there is a view across fields toward the Cross River Reservoir and the New England hills.

The original section of "Bedford Honour," the residence of Mr. and Mrs. Harold C. Whitman at Bedford, New York, is believed to have been built about the end of the seventeenth century. It is situated in the midst of fine old trees; among them are many large hemlocks.

The gardens—a green garden, a formal rose garden, a paved court containing a collection of fuchsias, a bowling green, and a wild garden, shown below—lead from one to the next in the English manner.

In landscaping its property in North Salem, New York, the Hammond Museum adapted the Stroll Garden, which originated in Japan. This is a series of well-designed and well-maintained Oriental gardens. Each tree and each shrub is important in itself, yet so placed that the entire planting becomes one harmonious design.

The willow garden, which is partially enclosed by dwarf fruit trees, is adjacent to a reflecting pool.

The feature of the "dry landscape garden" is a dry waterfall of white alyssum leading into a dry stream of blue lava stones. Rocks and moss suggest cliffs and banks of a natural water course, and dwarf evergreens accent this unusual scene.

HOW TO WRITE A BOOK ABOUT WILD FLOWERS

By HAROLD WILLIAM RICKETT

Senior Curator of Botany of The New York Botanical Garden.

PROBABLY FEW PERSONS who read books — and no persons who do not read them — know what goes into the making of a book.

The author writes out—or taps out on a typewriter—what he wants to say. He sends it to a publisher, who sends it to a printer—and the thing is done.

But it is not like that.

Now that the first volume of the WILD FLOWERS OF THE UNITED STATES has seen the light—and been seen by some—it may be instructive to tell something of how it was made.

First it was designed. Some tentative pages of text were written, some provisional photographs were assembled, and the book designer went to work, deciding upon the size of page, the face and sizes of type, the arrangement of matter on the page, and the make-up of the pages of color-illustrations. Sample proofs were obtained of the designer's lay-out, and, after a few false starts, the design of the book was established.

Then text was written. With the aid of two standard technical manuals which disagreed in many details, with frequent trips to herbarium and library, and with my own experience of plants in the field, descriptions of nearly two thousand species were written. This involved not only arranging the species in their genera and families by easily seen characteristics (eschewing the recondite criteria of the professional botanist), but disposing the families in a wholly artificial system to aid in identification by the layman.

This took all winter, with evenings and weekends added to regular working hours.

As the text was written, family by family, selections were made from the several thousand photographs which had poured in. Many of these were by our own photographer commissioned for the purpose, who had spent a season in the field with the generous cooperation of many botanists of the wide area treated in Volume 1. Some photographs were my own. And hundreds—thousands—were from interested amateurs, some of whom scarcely knew any wild flowers but the bloodroots and trilliums of spring, while others were proficient in finding, identifying, and even naming hundreds of species. In all, some fifty persons finally contributed to the illustration of the volume, furnishing about twelve hundred photographs. The selection of the most suitable photograph of each species consumed many hours of the author's life; and the voluminous correspondence, the making records of photographers' names and contributions, allotting payments for photographs used, and returning unwanted photographs—all this accounted for most of the time of an experienced secretary.

The photographs selected were arranged by the designer, working with the author, to make full-page plates. Each plate was individually treated with regard to the size and shape of the plants illustrated; no two plates are alike. The lay-outs were made on sheets of transparent paper which, with the actual transparencies, were forwarded to the printer. Before they were sent, they were gone over by author and printer's representative, working together, and necessary directions were indicated.

Meanwhile, drawings were made by the artist engaged for the purpose. These were planned to show distinctions between species not brought out by photographs. They were made mostly from dried specimens borrowed from the herbarium, sometimes from living plants collected within a hundred miles of the city. The aim was always to provide means of identification of plants; but aesthetic considerations were never neglected, and drawings were fitted in groups so as not to detract from the beauty of the printed page. The drawings were made first with pencil, then in ink on transparent acetate sheets which could be cut, juggled, and fitted together until the desired combinations were obtained.

Finally proof began to arrive. Each color-plate was scrutinized by author and printer's representative, and necessary corrections indicated. I made several trips to England for closer cooperation with the printer's experts in color and typography. The proof was returned to England, corrections made, and second proof received and studied. Sometimes a third proof was necessary, and occasionally even a fourth, before satisfactory reproduction was attained. Correcting and retouching these hundreds of color-photographs, each now represented by four black-and-white negatives, necessitated an enormous number of hours of highly skilled work; a kind of work for which it is increasingly difficult to find technicians.

Meanwhile proof of the text also was received, corrected, and returned to the printer. Pages were made up from the corrected galley-proof and subjected to final correction—especially the deletion or addition of words or sentences so as to even up columns of print, avoid lines of only one word, and generally to maintain the aesthetic qualities of the page. The author was continually admonished by the printer to make more text on some plants and to delete text on others!

The book was now ready for printing. The designer had approved the title-page, with a specially made painting by a well-known flower-painter. Foreword and preface were written and set in type. Printed sheets—ten thousand of them—carrying eight pages on each side, the color and line drawings in place but text represented by blank spaces, were shipped to New York. Special proofs of the text-pages were likewise sent across the Atlantic; from these by photo-lithography the text was printed in the spaces left for it on the sheets. Then the printed sheets went to the binder for folding, gathering, sewing, and covering.

That's all.

THE MANDARINS (DISPORUM)

The genus *Disporum* contains two species of eastern North America; others grow in the West and in Asia. The flowers hang singly or in twos or threes, like bells, from the tips of forked stems. The fruit is a red berry. The botanical name of the genus refers to the two rudimentary seeds in each chamber of the ovary; if all develop, there are six seeds in the berry.

YELLOW MANDARIN, D. LANUGINOSUM (16–30 inches), has yellowish-green petals and sepals, nearly an inch long, much longer than the stamens, slightly curved outwards.

May and June: in woods from New York to southern Ontario and southward to Georgia and Alabama. *Plate 2.*

NODDING MANDARIN, D. MACULATUM (8–24 inches), has white petals and sepals spotted with purple, often an inch long but shorter than the stamens, which project from the flower.

May: in woods in eastern Ohio and southward to Georgia and Tennessee; also in Michigan.

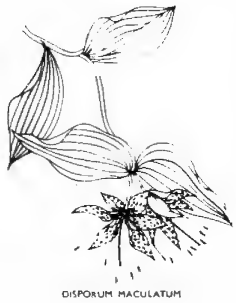
DOGTOOTH-VIOLETS or ADDER'S-TONGUES (ERYTHRONIUM)

The dogtooth-violets are welcome flowers of early spring throughout northeastern America, the yellow ones commoner towards the Atlantic, the white ones more abundant farther inland. To call a white or yellow flower a violet has offended some persons (though there are white and yellow violets!); among these persons was John Burroughs, who invented the names trout-lily and fawn-lily. Several English flowers have been called violets besides those of the genus *Viola*. All these are pink or purple, as is the European dogtooth-violet. The "dogtooth" part of the name refers to the little white bulb underground. The botanical name of the genus is from a Greek word meaning "red."

The plants are like miniature lilies with a single pendent flower on each stalk. The stalk is sheathed by a pair of glossy, often mottled leaves. Flower-stalk and leaves come from a small bulb deep underground. This also sends out slim white underground branches which form new bulbs at their tips. Bulbs that are formed from these tips or from seed send up only single leaves for several years before they produce a flower-stalk. Patches of such single leaves, without any flowers, may often be found in the woods.

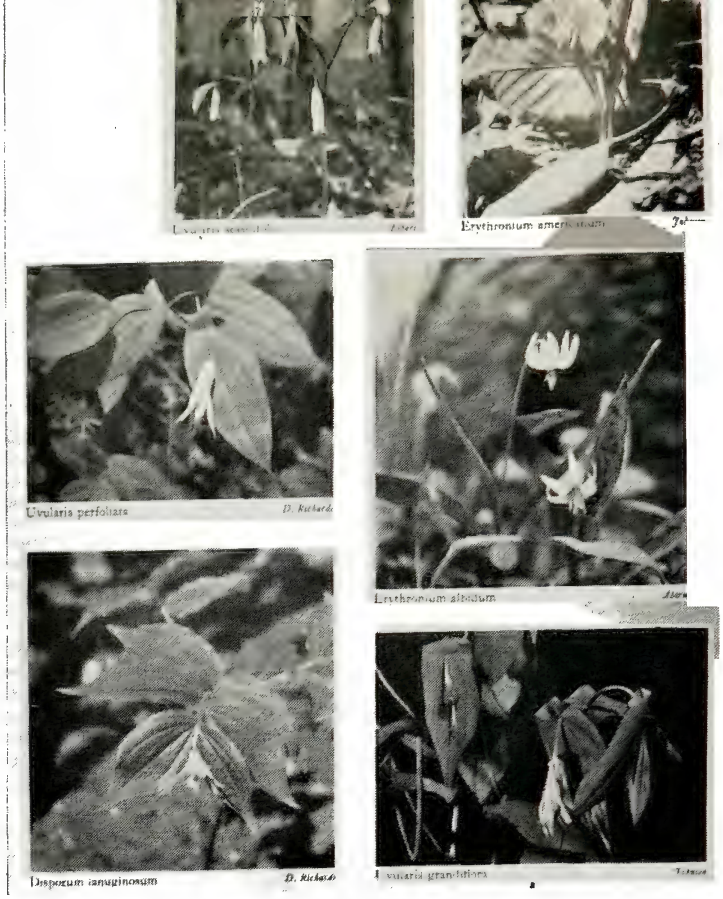
YELLOW DOGTOOTH-VIOLET, E. AMERICANUM (4–8 inches), has yellow sepals and petals which curve sharply upward; they are generally spotted with brown on the inside. The six brown stamens are in two circles of three, one group commonly a little shorter than the other. A number of varieties, differing by very minor details, have been named.

March to May: in wet woods and meadows from Nova Scotia to Minnesota and southward to Florida and Alabama; commoner eastward. *Plate 2.*



DISPORUM MACULATUM

ALLIUM TRICOCCUM



From *Wild Flowers of the United States,* Volume 1.

COURSES, LECTURES, AND OTHER GARDEN EVENTS

(For detailed information about a particular event or course, write or phone LU 4-8500)

CHILDREN'S GARDENCRAFT GRADUATION, September 10, 1966, 10 a.m.

"THE A, B, C'S OF THE ART OF BONSAI"—illustrated Saturday Afternoon Lecture with bonsai exhibit and demonstration, by Yuji Yoshimura, on September 10, 1966.

NAME THAT PLANT (6 sessions)—Wednesday morning class, 10 a.m.-12 noon. Starts September 14, 1966. Instructor—Eleanor Yarrow.

"SAFARI INTO THE CONGO"—illustrated Saturday Afternoon Lecture by Gertrude J. Helbling on September 17, 1966.

CHILDREN'S INDOOR GARDENCRAFT (6 sessions)—Saturday morning class, 9:30 a.m.-12 noon. Starts September 17, 1966. Instructors—Lillian Weber and Hetty Everett.

EXHIBIT OF UNITED STATES WILD FLOWERS, NORTHEASTERN REGION, on the occasion of announcing the publication of the first volume of *The Wild Flowers of the United States*: open daily to the public, starting September 17, 1966, for three weeks on the mezzanine of the Union Carbide Building, 47th Street and Park Avenue, New York City.

ELEMENTARY BONSAI (3 sessions)—Monday morning class, 10 a.m.-12 noon; Monday evening class, 8-10 p.m. Starts September 19, 1966. Instructor—Yuji Yoshimura.

FLOWER AND LANDSCAPE PAINTING (8 sessions)—Tuesday morning class, 9:45 a.m.-12:30 p.m. Starts September 20, 1966. Instructor—Edgar A. Whitney.

IN-SERVICE COURSE FOR TEACHERS: FLOWERING PLANTS (15 sessions)—Wednesday afternoon class, 3:45-5:25 p.m. Starts September 21, 1966. Supervisor—Elizabeth C. Hall.

CULTIVATION OF TREES AND SHRUBS (8 sessions)—Thursday morning class, 10-11:30 a.m.; Thursday evening class, 8-9:30 p.m. Starts Sptember 22, 1966. Instructor—Louis P. Politi.

FLOWER AND LANDSCAPE PAINTING (8 sessions) Friday morning class, 9:45 a.m.-12:30 p.m. Starts September 23, 1966. Instructor—Edgar A. Whitney.

"HOW TO GROW BETTER BEGONIAS"—illustrated Saturday Afternoon Lecture by Hertha A. Benjamin on September 24, 1966.

GENERAL BOTANY (8 sessions)—Monday morning class, 10-11:30 a.m.; Monday evening class, 8-9:30 p.m. Starts September 26, 1966. Instructor—Dr. Herman F. Becker.

SATURDAY AFTERNOON NATURE WALKS start October 1, 1966, and continue through December 10, 1966. Leader—Eleanor Yarrow.

AUTUMN ASPECTS OF DECIDUOUS TREES AND SHRUBS (8 sessions)—Saturday morning class, 10 a.m.-12 noon. Starts October 1, 1966. Instructor—Eleanor Yarrow.

"AUTUMN COLORATION: THE FINEST SHOW ON EARTH"—illustrated Saturday Afternoon Lecture by Dr. Edwin B. Matzke on October 1, 1966.

"RUSSIA THROUGH THE EYES OF A NATURALIST"—illustrated Sunday Afternoon Lecture by Dr. Theodore Kazimiroff on October 2, 1966.

"SUCCESSION OF WILD FLOWERS IN A WESTCHESTER PASTURE"—illustrated Saturday Afternoon Lecture by Warren Cooper on October 8, 1966.

"INVENTIONS IN NATURE"—illustrated Sunday Afternoon Lecture by Dr. Harold N. Moldenke on October 9, 1966.

INTERMEDIATE AND ADVANCED BONSAI (6 sessions)—Monday morning class, 10 a.m.-12 noon; Monday evening class, 8-10 p.m. Starts October 10, 1966. Instructor—Yuji Yoshimura.

"PORT TOWNS OF THE MEDITERRANEAN"—illustrated Saturday Afternoon Lecture by Anne Neylon on October 15, 1966.

"A GARDENER VISITS SOUTH AMERICA"—illustrated Sunday Afternoon Lecture by T. H. Everett on October 16, 1966.

HOW TO PRUNE (3 sessions)—Tuesday afternoon class, 1:45-3:15 p.m.; Tuesday evening class, 8-9:30 p.m. Starts October 18, 1966. Instructor—T. H. Everett.

LANDSCAPE GARDENING (7 sessions)—1st-year class, 8-10 p.m., starts October 18, 1966. 2nd-year class, 8-10 p.m., starts October 20, 1966. Instructor—Arthur F. Murphy.

"NATURAL HISTORY OF ISRAEL: ARCHAEOLOGY, FLORA, PEOPLE"—illustrated Saturday Afternoon Lecture by Dr. Theodore Kazimiroff on October 22, 1966.

"A BOTANIST IN YOUR GROCERY STORE"—illustrated Sunday Afternoon Lecture by Dr. Richard A. Howard on October 23, 1966.

"THE FLORA OF THE NEW JERSEY PINE BARRENS"—illustrated Saturday Afternoon Lecture by Mr. and Mrs. Burton Dezendorf on October 29, 1966.

PLANT SELECTION (6 sessions)—Wednesday morning class, 10 a.m.-12 noon. Starts November 2, 1966. Instructor—Alice Dustan Kollar.

CULTIVATION OF ORCHIDS FOR HOME AND SMALL GREENHOUSE (3 sessions)—Thursday evening class, 8-9:30 p.m. Starts November 3, 1966. Instructor—Charles M. Fitch.

CHILDREN'S PLANT WORKSHOP (3 sessions)—Saturday morning class, 10:30-11:30. Starts November 5, 1966. Instructors—Mrs. F. R. Heuberger, Mrs. S. Lasker, Mrs. F. S. Levi, Jr., and Mrs. R. G. Reimss.

CHRYSANTHEMUM SHOW in the Conservatory of The New York Botanical Garden begins November 5, 1966.

"WILD FLOWER TRAILS IN PALISADES INTERSTATE PARK"—illustrated Saturday Afternoon by Alice and Glenn Foss on November 5, 1966.

"TAHITI: ITS PLANTS AND PEOPLE"—illustrated Saturday Afternoon Lecture by Dr. Lindsay S. Olive on November 12, 1966.

The Saturday Afternoon Lectures and the Sunday Afternoon Lectures will be given in the Auditorium of the Museum Building at 3:15 p.m., preceded by a half hour of recorded music.

Admission to the Saturday Afternoon Lectures, 25 cents; to the Sunday Afternoon Lectures, 50 cents. Free to Members of the Garden (upon presentation of membership card) and free to children under twelve years of age who are accompanied by an adult.

Fee $1.00 per person for Nature Walks. For fees of the courses, and where they are given, see the Educational Program.

NEWS, NOTES and COMMENTS

An Impressive Graduate Ceremony was held at The New York Botanical Garden on June 7, 1966, when those who had satisfactorily completed the Two-Year Courses in Botany, in Practical Gardening, and in Landscape Gardening received certificates. Certificates were also presented to fourteen high school students who completed the Municipal Cooperative Education Course.

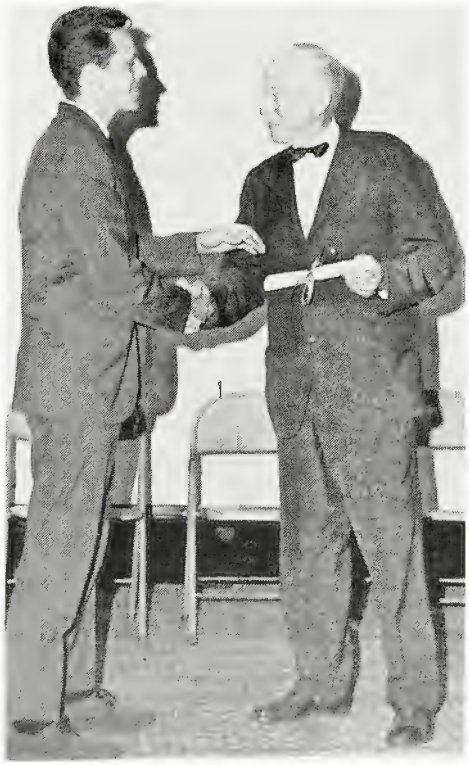
Dr. P. P. Pirone, Senior Plant Pathologist, presided in the absence of T. H. Everett, Assistant Director (Education) and Senior Curator of Education, who was in England. Elizabeth C. Hall, Associate Curator of Education, welcomed the representative gathering of relatives and friends.

Hon. Charles A. Loreto, Justice of the Supreme Court of the State of New York, gave a very inspiring address, entitled "A Judge Walks Through Our Gardens." He introduced Mrs. Arthur Hays Sulzberger, a member of the Board of Managers, who had been largely responsible for raising funds to initiate the Municipal Cooperative Education Course at the Garden.

Dr. Samuel W. Lambert, Jr., a member of the Board of Managers, assisted by Lillian Weber, instructor in the Education Department, presented certificates to the following:

Two-Year Course in Botany: Kurt Daniel Bahr, Mildred R. Becker, Robert G. Coghlan, Thomas Eaton, Florence Forbes, Alice Foss, Bernard J. Handler, M.D., Bernard A. Heyman, Frances Heyman,

Dr. Samuel W. Lambert, Jr., a member of the Board of Managers, presents certificate to John J. Rolla, a Garden employee, who completed the Two-Year Course in Gardening



Hon. Charles A. Loreto, Justice of the Supreme Court of the State of New York, was the speaker at the Graduation Ceremony.

Leonard J. Miller, Harold Murray, Elizabeth A. Parker, Mildred Phillips, John Russo, Harvey Simmonds, Betty S. Smith, Irene S. Tanigaki, Joseph P. Yagodzinski.

Two-Year Course in Practical Gardening: Robert Borzacchini, Armando Cecere, Nancy Belcher First, Nathan Goldberg, Margaret S. Johnson, Eleanor E. Kahn, Joseph C. Keegan, Robert A. Lehman, Anthony A. Mancuso, John Matarese, Hazel O'Brien, John J. Rolla, George J. Scherer, Harvey Simmonds, Salvatore A. Vignali, Harry Walters.

Two-Year Course in Landscape Gardening: Kurt Daniel Bahr, Dorothy R. Ferry, Aimee W. Hirshberg, Edward Hoffman, Joan S. Nieberg, Lewis G. Nieberg, William J. Polchinski, Jordan M. Schiffman, Nicholas Senkevitch, Robert E. Ungemack, Robert Whitehead.

Municipal Cooperative Education Course: Donald Amantea, Michael Balint, Ronald Bugge, Walter Frey, William C. Frey, Robert Furey, Neil Halbekath, William Johnson, Michael Lamadore, Thomas Muhlfeld, Matthew Pozzuto, James Scollins, Alfred Tesan, Salvatore A. Vignali.

Mrs. John W. Donaldson of Deep Hollow Farm, Millbrook, New York, and a member of the Native Plant Garden Committee of The New York Botanical Garden, received the following citation from Bennett College:

She was a small child when her first view of the lovely pink lady's-slipper opened her eyes to the beauty of our wild flowers. The magic of that moment has ever since stayed with her, deepening into a profound knowledge of our native flora, a joy in their use in creative garden design, and a passion for seeing that our wildings and their habitats are conserved for the delight of future generations.

These enthusiasms she has succeeded in communicating to others—by her writings by her selfless service to botanic gardens. garden clubs, and conservation societies; and by permitting countless visitors from

near and far to share the pleasures and example of her wild-flower plantings at Deep Hollow Farm.

For the beauty she has preserved at Millbrook, for her magnificent efforts to conserve similar beauty throughout our land, Bennett College awards this citation to its good friend and admired neighbor, Renee du Pont Donaldson.

Mrs. Sima Eliovson of Johannesburg, South Africa, author of several garden and botanical books, the latest being *Proteas for Pleasure,* visited the Garden and, on June 2, 1966, gave a seminar for staff members and students on "South Africa Wild Flowers." Her talk was illustrated by beautiful colored slides.

Professional Horticultural Exploration of England and Scotland. T. H. Everett, Assistant Director (Horticulture) and Senior Curator of Education, conducted the tour, the first of its kind to be sponsored by The New York Botanical Garden, during June, 1966. It was "most successful," "a congenial group," "a very enjoyable trip," and gave the participants the opportunity of seeing private gardens and horticultural establishments they would have been unable to visit under their own auspices.

Among the tour members were Dorcas Brigham of Cashiers, North Carolina, and Mount Dora, Florida, formerly owner of Village Hill Nursery in Williamsburg, Massachusetts; James S. Clark, former Superintendent of Grounds of Princeton Univeristy; Bernard Harkness, Taxonomist of the Rochester Park System, and Mrs. Harkness; Frederic Heutte, former Director of the Norfolk Botanic Garden and Mrs. Heutte; James S. Jack, Superintendent of the Mrs. Flagler Matthews Estate at Rye, New York; Prof. Ray A. Keen of Kansas State University; D. Melrose, Superintendent of the grounds of Swarthmore College; Joseph A. Witte, Assistant Director of the University of Washington Arboretum; David B. Paterson, Horticulturist of Longwood Gardens, and Mrs. Paterson; Herman S. Porter, in charge of the development of the Bartlett Arboretum in North Carolina, and Mrs. Porter; Mr. and Mrs. Harold Epstein and Jerome Lukins, members of The New York Botanical Garden.

VISITORS TO THE GARDEN

Dr. Siwert Nilsson, Palynological Laboratory, Solna, Sweden.

Dr. Fred A. Barkley, Northeastern University, Boston, Mass.

Dr. Walter S. Flory, Wake Forest College, Winston-Salem, N.C.

Dr. Rolf Santesson, University of Uppsala, Uppsala, Sweden.

Chester Frankton, Plant Research Institute, Ottawa, Canada.

C. W. Laskowski, University of Michigan, Ann Arbor.

Dr. and Mrs. Rolla Tryon, Gray Herbarium, Cambridge, Mass.

Ramian Riba, Jardin Botanica, Mexico City, Mexico.

Dr. Lindsay S. Smith, Museum and Herbarium, Botanic Gardens, Brisbane, Australia.

Dr. Andre Robyns, Missouri Botanical Gardens, St. Louis.

Dr. José de Jiménez, Santiago, Dominican Republic.

Dr. A. Lindenmayer, Queens College.

C. Name, United Nations.

Mr. and Mrs. van Hasselt, Miss Corinne Hepker, South African Botanical Society.

D. Wang and N. Pichitakul, Boyce Thompson Institute for Plant Research, Yonkers, N. Y.

J. R. William, C.S.I.R.O., Canberra, Australia.

Dr. S. Ogiso, Athens, Ga.

Dr. Mason Hale and Dr. Harold Robinson, Smithsonian Institution, Washington, D.C.

Dr. E. S. Beneke and Dr. A. Rogers, Michigan State University, East Lansing.

Dr. Peter Hunt, University of the West Indies, Jamaica.

Harold Burdsall, Jr., Cornell University, Ithaca, N. Y.

Professor P. Maheshwari of the Department of Botany of the University of Dehli died on May 18, 1966. Dr. Maheshwari, an eminent scholar and botanist, a member of the International Society of Plant Morphologists, visited The New York Botanical Garden on several occasions.

Activities of the Director and Staff. During recent months Dr. William C. Steere, Director, has attended meetings of the Council of the American Association of Museums in Washington, D. C., and in Aspen, Colorado. He was elected Vice President of this organization at its annual meeting in June. He was also elected Vice President of Section T—the section on information and communication—of the American Association for the Advancement of Science. This month, September, he will attend a meeting of the Trustees of *Biological Abstracts* in Philadelphia and the bicentennial celebration of Rutgers—The State University at New Brunswick, New Jersey.

Dr. Pierre Dansereau attended the annual meeting of the Royal Society of Canada, held at the University of Sherbrooke, Quebec.

John Reed, Curator of the Library, and Mrs. Reed, attended the fifty-seventh annual convention of the Special Libraries Association held in Minneapolis, May 30-June 3, 1966. Mr. Reed concentrated on the meetings of the Documentation and Aerospace Divisions, which were primarily devoted to data processing techniques in library operations. Mrs. Reed attended the meetings of the Museum and Biological Sciences Division.

Dorothy Ebel Hansell, Editor of *The Garden Journal,* lectured during Garden Week, August 29-September 2, 1966, at Lake Mohonk House, Mohonk, New York. The subject of her illustrated lectures were "Four Seasons at The New York Botanical Garden," "Shade Gardening," and "Rock Gardens and Water Gardens."

Sven O. Karell assumed the duties of Associate Curator of the Library on July 1, 1966. He will be responsible for cataloging activities. Previous to his appointment at The New York Botanical Garden, Mr. Karell was senior cataloger in the library of Portland State College. He has also been employed in the libraries of Oregon State University, University of Michigan, University of Vermont, and the University of Pennsylvania.

Student Appointments. Gary Samuels, a graduate of Pennsylvania State University, has been appointed a graduate research assistant to Dr. Clark Rogerson, Curator of the Cryptogamic Herbarium under Dr. Rogerson's garnt from the National Science Foundation. Mr. Samuels will spend half time at the Garden and half time at Columbia University where he will pursue postgraduate work in mycology.

Peter L. Achuff, a graduate of the University of Montana, has been appointed a graduate assistant in the Department of Taxonomy under Dr. Bassett Maguire, Head Curator and Coordinator of Tropical Research. He is also engaged in postgraduate studies at Columbia University.

Gert Christofferson, who is a student at the University of Copenhagen, Denmark, spent the summer at the Garden, working under Dr. Rogerson's guidance.

Clarence E. Godshalk, Director of the Morton Arboretum, received the 1966 Johnny Appleseed Award of the Men's Garden Club of America. The organization awarded its gold medal to Schreiner's Iris Gardens at Salem, Oregon.

Dr. Marion T. Hall has been appointed Director of the Morton Arboretum and will succeed Clarence E. Godshalk, the Arboretum's first director, upon his retirement September 27, 1966, on the forty-fifth anniversary of his arrival there.

Dr. Hall goes to Morton Arboretum from the University of Oklahoma at Norman where he was Director of the Stovall Museum of Science and History and a professor in the Department of Botany. He previously held the position of botanist at Cranbrook Institute of Science, Bloomfield Hills, Michigan, for six years and the next six years headed the Department of Botany at Butler University, Indianapolis. He served one year as Acting Director of the Michigan Botanic Garden at Ann Arbor.

Earl Edward Sherff, widely known for his writings on the taxonomy of the dahlia, cosmos, and bidens, died May 16, 1966, at the age of seventy-nine. Dr. Sherff had collaborated with The New York Botanical Garden on a number of projects, all in the *Compositae.*

He served as associate editor of the *Botanical Gazette* and of *Brittonia,* as president and as a member of the Council of the American Society of Plant Taxonomists, and as a member of the Council of the American Association for the Advancement of Science. A new science

building and a new botanical library at Illinois Wesleyan University, Bloomington, were named in his honor.

Among his 140 published papers on taxonomic botany, many were published by the Field Museum, of which he was elected a research associate in systematic botany in 1936. He was also named a Contributor to the Museum for his gift of nearly fourteen thousand herbarium specimens and thousands of photographs of type or critical specimens. One of his early works, *New Species of Xanthium and Solidage,* was a joint paper with Dr. C. F. Millspaugh, the Field Museum's first curator of botany, published in *Fieldiana* in 1918.

How Tanglewood in the Berkshires keeps its grass green. By mid June most well-cared for New England lawns take on the appearance of carefully vacuumed green carpets and tend to remain that way, barring drought, through the summer. But consider such a lawn after thousands of feet have tramped over it in the "hot" months of July and August.—would it still be lush after such merciless treatment? It is a difficult question to answer but seeing is believing, and it is recommended that one cast a discerning eye over the great lawns at the Boston Symphony Orchestra's summer home at Tanglewood in Lenox, Massachusetts.

The twenty acres of Tanglewood lawn look as fine as they do because of a planned program of intensive care which could be adapted by home owners who fret over the condition of their lawns. The original problem at Tanglewood was compaction, too much thatch, and lack of root system. To combat the compaction the lawns are aerified several times in spring and fall. During summer when thousands of visitors walk daily on the grass, a slicing machine is used every seven to ten days. Both of these processes allow water, fertilizer, and air to reach the root system, developing and maintaining it.

In the spring and fall before fertilizing, an aero-thatch machine removes thatch or dead grass.

After being aerified in September the lawns are heavily fertilized. This helps to establish a healthy root system while the growing season is still in progress. A lighter application of fertilizer is applied when spring growth is well under way, approximately six weeks after the first mowing. In August soil samples are collected and tested for fertility and acidity. If lime is needed (to reduce acidity), it is applied during the winter when the ground is frozen.

Weeds and pests, always lawn problems, are disposed of in early spring by application of insecticides and weed killers from a tank sprayer.

James Kiley, the Superintendent of Tanglewood and the Boston Symphony Orchestra's grass expert, maintains that this program has brought the Tanglewood lawns to their present excellent condition, but none of these methods of lawn care would be of any value without sufficient water. During the last few years of severe drought in the Northeast when water has not been available from normal sources, an irrigation system, which draws water from a spring-fed, man-made pond at Tanglewood, was installed under Mr. Kiley's supervision. Since the great lawn is a vital part of Tanglewood, providing space for the audience, the Boston Symphony Orchestra could ill afford to lose the grass or the thousands of dollars which would be required to replace the lawn.

The home owner would not, of course, rush out and order twenty-two yards of topdressing, but he can scale down the method and quantities to fit the size of his lawn and obtain satisfactory results, even when the lawn is subjected to children's hard treatment.

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The Chicago Horticultural Society has announced the appointment of Harry Weese and Associates of Chicago as building architects for the botanic garden, currently under development by the Society. The garden will be located on a three-hundred-acre tract at the north end of the Skokie Lagoons, west of Glencoe.

Construction began last fall with the installation of a mile-long, four-foot concrete conduit to divert the polluted waters of the Skokie stream. The landscape architect and engineers are now working on plans for the main island and adjoining islands, which will form the central attraction of this botanical garden. Ninety of the three-hundred acres will be water.

On the twenty-five-acre main island the administration building and visitors' center, which Mr. Weese will design, will be located. Some of Mr. Weese's accomplishments are the Pierce Tower residence halls at the University of Chicago and the renovation of Orchestra Hall and Newberry Library. Many of his activities are national in scope—at the University of Colorado, University of Wisconsin, Massachusetts Institute of Technology, the Arena State Theatre in Washington, D.C., and the United States Embassy in Ghana.

The Tenth Ornamental Plant Exploration, sponsored cooperatively by the Agricultural Research Service of the United States Department of Agriculture and Longwood Foundation, Inc., of Kennett Square, Pennsylvania, is now in its second month in South Korea. Dr. Edward G. Corbett of the Agricultural Research Service and Dr. Richard Lighty of Longwood Gardens will spend another two months exploring the Korean peninsula south of the 38th parallel, the island of Cheju off the southern coast, and the island of Dagelet eighty miles off the coast in the Sea of Japan.

The purpose of these plant explorations is to obtain new ornamental plants and improved breeding stock for ornamentals now grown in this country.

The Garden History Society, which was organized this year, has already attracted a number of members in America.

There may be others interested in joining the Society whose objectives are: a) to promote the study of the history of gardening and horticulture, b) to publish annual transactions, d) to form and maintain a library of relevant documents, photographs, and slides, e) to preserve documents, plans, designs, drawings, catalogues, letters, etc., connected with the study of garden history, and f) to work with the Royal Horticultural Society and other similar bodies.

Dues are $6.00 a year. Further information may be had by writing Peter Hunt, Boyke Tolly, Ottinge, Elham nr. Canterbury, Kent, England.

New Roses for 1967. All-America Rose Selections for 1967 were recently announced: 'Roman Holiday', an orange-red floribunda which has an illusive tea fragrance, the fragrance varying considerably with the location and the soil conditions; 'Gay Princess', a soft shell-pink floribunda, which makes a fine garden plant and attractive cut flower; 'Lucky Lady', a free-blooming floribunda, which produces some of its fully double, clear pink flowers (with twenty-five to thirty petals) in clusters, others on single stems, and 'Bewitched', a phlox-pink, large-flowered hybrid tea with a pleasing spicy fragrance.

Floral Emblem for Italy. The Italian government has selected the Italian stone pine, *Pinus pinea,* as the national floral emblem. It appeared on April 30, 1966, as the first postage stamp in the first floral series to be issued by Italy.

The proposal for a national floral emblem was offered by *Fiori.* The Technical Commission, appointed by the Minister of Tourism, unanimously agreed upon *Pinus pinea* from a selection including *Arbutus unedo, Bellis perennis, Iris florentina, Olea europaea,* and *Punica granatum.*

The first floral stamp issued by the Italian government bears the national emblem, *Pinus pinea.*

Tat Shinno constantly experiments with easily grown plants which may be adapted to distinctive floral arrangements. Here she combines the Jewel nasturtium, an improved strain in which the flowers are not hidden by the foliage, with grapes and *Cyperus alternifolius.*

BRIEF NOTES ON RECENT BOOKS

FLOWERS

THE WORLD OF FLOWERS. Reisigl, Herbert, (ed.). 240 pages, illustrated (part color). The Viking Press, Inc., New York, N. Y. 1966. $12.50.

In this profusely illustrated book, in color and black and white, Dr. Reisigl of the Botanical Institute of the University of Innsbruck enjoyed the cooperation of botanists and flower lovers throughout the world. The book was published originally in Germany in 1964.

The text comprises twenty or more essays by internationally known botanists on such topics as "In the Valleys of the Himalayan Cedars," "The Plant World of Australia," "The Floral Splendour of the Philippines," "Proteas of South Africa," "The Plant World of the Mediterranean Country," "The Azalea Miracle in the Smoky Mountains," and "Botanical Gardens and Parks in the Soviet Union."

A section is devoted to "Notes to the Illustrations" and "Botanical Gardens, Parks, and Floral Regions."

THE BULB BOOK. Schauenberg, Paul. 292 pages, illustrated (color), line drawings, indexed. Frederick Warne & Co., New York, N. Y. 1966. $10.00.

Originally published in Switzerland under the title *Les Plantes Bulbeuses* in 1964, translated and published in England in 1965, this informative volume is now available in the United States. There are chapters on the biology, geography, and history of bulbous plants, certain scientific aspects, their decorative uses, their cultivation and propagation, pests and diseases.

FLOWER ARRANGEMENTS

FLOWER ARRANGEMENTS TO COPY. Shinno, Tat. 246 pages, illustrated (part color), indexed. Doubleday & Co., New York, N. Y. 1966. $7.95.

The author has created unusual floral and plant arrangements for offices and restaurants as well as for homes in many parts of the country. She conducts her own flower arranging school in California. Miss Shinno, who has studied floral design and brush calligraphy in this country and Japan, is responsible for the enchanting drawings. Each drawing is accompanied on the opposite page by notes on the container, holder, and materials, and instructions on the particular arrangement.

GARDENING AND LANDSCAPING

COMPLETE BOOK OF THE GARDEN. Reader's Digest Editors. 896 pages, illustrated, indexed. Little, Brown & Co., Boston, Mass. 1966. $9.95.

T. H. Everett, Assistant Director (Horticulture) and Senior Curator of Education of The New York Botanical Garden, was general editor and technical adviser of this comprehensive book on gardening. It is divided into six parts: Flowers and Plants in the Home, Plants for the Garden —An Endless Choice, Your Home in a Garden Setting, Special Gardens, Regional Gardening, The Wonders of Plant Growing, and Enemies of the Garden. The supplement contains Calendar of Work, glossary, and index.

Among the consultants were two other members of the Garden staff, Elizabeth C. Hall, Associate Curator of Education, and Dr. P. P. Pirone, Senior Plant Pathologist.

DESIGNING A GARDEN TODAY. Grant White, J. E. 184 pages, illustrated, indexed. Abelard-Schuman Ltd., New York, N. Y. 1966. $6.50.

The author, the fourth generation in his family to be a landscape gardener, has drawn on an accumulation of forty years of experience in writing this book.

An English publication, there are, nevertheless, many ideas which can be adapted in designing gardens in this country. The reader, however, must be mindful of the fact that all the plants recommended in *Designing a Garden Today* will not thrive under our climatic conditions.

ITALIAN LANDSCAPE IN 18TH CENTURY ENGLAND. Manwaring, Elizabeth Wheeler. 243 pages, illustrated, indexed. Russell and Russell, New York, N. Y. 1965. $8.50.

This is a re-issue of the "study chiefly of the influence of Claude Lorrain and Salvatore Rosa on English taste 1700-1800," which was first published in 1925.

TREES

INTRODUCTION TO TREES. Kieran, John. 77 pages, illustrated (color), indexed. Doubleday & Co., New York, N. Y. 1966. $4.50.

This is a new edition of a popular book by naturalist John Kieran, which was first published in 1954.

MISCELLANY

THE LIVING CYCADS. Chamberlain, Charles Joseph. 172 pages, illustrated, indexed. Hafner Publishing Co., New York, N. Y. 1965 (rec'd. 1966) $4.00.

This facsimile of the original edition, published in 1919, will be well received, for this interesting book on a decorative group of plants has long been out of print.

THE ORIGIN OF CULTIVATED PLANTS. Schwanitz, Franz. 175 pages, illustrated, indexed. Harvard University Press, Cambridge, Mass. 1966. $4.75.

Translated from the German edition, published in 1957, this book provides a concise account of the transformation of wild species into cultivated plants and is directed to the non-specialist. It will appeal to the serious gardener, especially one interested in plant breeding.

INSECTS. Hutchins, Ross E. 324 pages, illustrated, indexed. Prentice-Hall, Inc., Englewood Cliffs, N. J. 1966. $6.95.

Dr. Hutchins, an authority on insects, has written a fascinating book about them and their habits, tracing their development from prehistoric days. This prominent scientist contributes regularly to scientific and popular magazines and is the author of a number of fine books.

Joseph Wood Krutch, the renowned naturalist and author, was the consulting editor for *Insects;* Stanley Wyatt, the illustrator, and his drawings are delightful. The many fine black and white photographs were taken by the author.

A MONOGRAPH ON CHLORDANE—TOXOLOGICAL AND PHARMACOLOGICAL PROPERTIES. Ingle. L. Velsicol Chemical Corp., Chicago, Ill. 1965.

Dr. Ingle, Professor of Zoology at the University of Illinois, prepared several years ago a summary on the toxological data then available on chlordane. He has written the present monograph to "provide a comprehensive and factual review" and "to make such information available to the many . . . . who maintain a vital interest in the preservation of man, his environment, and his economy."

JOHN TORREY—A STORY OF NORTH AMERICAN BOTANY. Rodgers, Andrew Denny III. 352 pages, indexed. Hafner Publishing Company, New York, N. Y. 1965 (rec'd. 1966). $7.50.

A very nice facsimile of the 1942 edition in which the author skillfully portrayed the career and accomplishments of John Torrey, "a pioneer taxonomic botanist in America."

FLORA OF THE PRAIRIES AND PLAINS OF CENTRAL NORTH AMERICA. Rydberg, Per Axel. 969 pages, illustrated, indexed. Hafner Publishing Company, New York, N. Y. 1966. $12.00.

This facsimile of the 1932 edition is welcome, since the original is not available.

The late Dr. Rydberg was Curator of the Herbarium of The New York Botanical Garden.

THE GARDENER'S BOOK OF VERSE. Wilson, Helen Van Pelt. 128 pages, indexed. William Morrow & Company, Inc., New York, N. Y. 1966. $4.50.

In this attractive small volume, Mrs. Wilson presents selections from her favorite poems celebrating the seasons of the year. Some are universally known, others less familiar, but all will appeal to gardeners and nature lovers alike, since they are expressions from Emily Dickinson, Keats, Millay, Shelly, Swinburne, Wordsworth, and other fine poets.

WEEDS OF THE WORLD: BIOLOGY AND CONTROL. King, Lawrence J. 526 pages, illustrated, indexed. The University Press, Great Britain, distributed by Interscience Publishers, Inc., New York, N. Y. 1966. $18.00.

In this volume, one of the series of the Plant Science Monographs edited by Professor Nicholas Polunin, Dr. King presents a timely study of the origin, spread, and control of weeds, an important consideration in the vast problem of feeding and controlling the world's great population.

A HISTORY OF GENETICS. Sturtevant, A. H. 165 pages, bibliography, indexed. Harper & Row, New York, N. Y. 1965 (rec'd. 1966). $5.50.

The author, an internationally known geneticist, covers the history of genetics from the days of Aristotle to 1950 and evaluates pertinent events and developments.

FLOWER POLLINATION IN THE PHLOX FAMILY. Grant, Verne and Karen A. 180 pages, illustrated (part color), indexed. Columbia

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University Press, New York, N. Y. 1965 (rec'd. 1966). $5.75.

Dr. and Mrs. Grant, he is geneticist at Rancho Santa Ana Botanic Garden and she is a research biologist there, collaborated in field work in western North America and in considerable experimental work on the pollination and breeding system in the Phlox Family, under a five-year grant from the National Science Foundation. And they collaborated in the presentation of this book, which is accompanied by several pleasing and informative colored plates and many fine drawings.

BIOGRAPHICAL NOTES UPON BOTANISTS. Barnhart, John Hendley (compl. by), G. K. Hall, Boston. 1966. $250.00.

Published in three volumes, the Biographical Notes furnish data on some 44,-700 botanists from the earliest days to the present. Horticulturists who have contributed to scientific knowledge are also included. The late Dr. Barnhart compiled this material while he was Bibliographer at The New York Botanical Garden.

THE GRAMINEAE. Arber, Agnes. 480 pages, illustrated, indexed, bibliography. Stechert-Hafner Service Agency, Inc., New York, N. Y. 1965 (rec'd. 1966). $15.00.

Agnes Arber's study of cereal, bamboo, and grass, published in 1934, is reprinted as Vol. XII of the series "Historia Naturales Classica" edited by J. Cramer and H. K. Swann.

The reprint carries an introduction by William Derek Clayton.

THE GROWTH OF CEREALS AND GRASSES. Milthorpe, F. L. and J. D. Ivins (eds.). 358 pages, illustrated, indexed. Butterworth, Inc., Washington, D. C. 1966. $19.00.

The proceedings of the Twelfth Eastern School in Agricultural Science, held at the University of Nottingham in 1965, present detailed and up-to-date information on "Vegetative Development," "Reproductive Development," "Environment and Responses to Environment," "Biochemical and Agronomical Aspects."

BIOLOGICAL TECHNIQUES. Knudsen, Jens W. 525 pages, illustrated, indexed. Harper & Row, New York, N. Y. 1966. $12.00.

This manual treats of professional methods of collecting, preserving, and illustrating natural history material. The first chapter is devoted to "General Collecting Sites and Techniques," the next four to "The Algae," "The Fungi," "The Mosses and Liverworts," and "The Higher Plants," and the remaining chapters to insects, reptiles, birds, mammals.

The author, Associate Professor of Biology and Head Curator of the Museum of Natural History at Pacific Lutheran University, has presented the information accurately and simply, so that his book will be useful at all levels of biological study.

WOOD DICTIONARY, Vol. 2. Boerhave-Beekman, W. (compl. and arr. by). 642 pages. American Elsevier Publishing Co., New York, N. Y. 1966. $27.00.

Volume 1, published two years ago, was concerned with Commercial and Botanical Nomenclature of World-Timbers; Sources of Supply. This new volume presents tables on production, transportation, and trade in seven languages – English/American, French, Spanish, Italian, Swedish, Dutch, and German.

Wood Dictionary is a useful tool for explorers, timber experts, merchants, and institutions involved with world forests and forestry.

GOVERNING SOIL CONSERVATION. Morgan, Robert J. 399 pages, illustrated, indexed. The Johns Hopkins Press, Baltimore, Md. 1966. $8.00.

This book, dealing with the government of soil conservation programs since their inception, is one of the Resources of the Future, Inc., studies in land use and management. The early chapters cover some of the complex and provocative issues reflected in the efforts of successive Secretaries of Agriculture to administer the soil conservation program according to the objectives of the United States Department of Agriculture.

Federal and State relationships and district programs and projects are covered in the remaining chapters. In the last chapter Dr. Morgan considers administrative, economic, and political problems which may confront the soil conservation program in the future.

THE BAMBOOS, A FRESH PERSPECTIVE. McClure, F. A. 347 pages, illustrated, glossary, indexed. Harvard University Press, Cambridge, Mass. 1966. $10.00.

The author is an authority on bamboos, having spent a lifetime in their study. He has seen living plants of more kinds of bamboo than any other man, and has also spent many years studying them in the herbarium of the Smithsonian Institution.

So that his knowledge of bamboos would be available to a wide circle, the Maria Moore Cabot Foundation of Harvard University made possible the publishing of this excellent work, which is clearly and also artistically illustrated with pen and ink sketches.

Sunday Afternoon Lectures

A new feature in the fall of 1966 and the spring of 1967 will be the Sunday Afternoon Lectures, to be given at 3:15 p.m. in the Auditorium of the Museum and Administration Building.

Scheduled for this fall:

October 2—
RUSSIA THROUGH THE EYES OF A NATURALIST
Dr. Theodore Kazimiroff

October 9—
INVENTIONS IN NATURE
Dr. Harold N. Moldenke

October 16—
A GARDENER VISITS SOUTH AMERICA
T. H. Everett

October 23—
A BOTANIST IN YOUR GROCERY STORE
Dr. Richard A. Howard

Admission to each lecture is fifty cents. It is free to members of The New York Botanical Garden upon presentation of membership card, and free to children under twelve years of age who are accompanied by an adult.

SMITHSONIAN TREASURY OF 20TH CENTURY SCIENCE. True, Webster P. (ed.). 544 pages, illustrated, indexed. Simon and Schuster, New York, N. Y. 1966. $7.95.

In the Preface, S. Dillon Ripley, Secretary of the Smithsonian says, "In the interest of furthering the second of the Smithsonian's stated purposes, the diffusion of knowledge, the Institution has joined with Simon and Schuster in assembling this volume which aims at presenting a cross section of some of the remarkable scientific achievements of the twentieth century."

The contents of the volume is diversified, emphasizing the "newer branches of investigation and recent advances in established science," as chapter titles indicate: "Beyond the Milky Way," "Navigation–from Canoes to Spaceships," "Digital Computers: Their History, Operation, and Use," "The Place of Genetics in Modern Biology," "Man as a Maker of New Plants and New Plant Communities."

A WINE-GROWER'S GUIDE. Wagner, Philip M. 224 pages + i to xii. Alfred A. Knopf, New York, N. Y. 1965. $5.95.

Plant nutrition, soil management, new insecticides and fungicides, and other modern developments in the management of a vineyard have been added to this revised edition of *A Wine Grower's Guide* which was originally published in 1945. It is intended primarily for the amateur, but professional grape growers also find this book useful.

CHROMOSOMES, GIANT MOLECULES, AND EVOLUTION. Wallace, Bruce. 171 pages, illustrated, indexed. W. W. Norton & Co., Inc., New York. 1966. Cloth $5.00, paper $1.95.

The author, Professor of Genetics at Cornell University, has written a clear explanation of the important contributions genetics has made to the theories of evolution during the past thirty years or so. He presents his material in nontechnical language so that it can be understood by nonbiologists.

LETTERS TO THE EDITOR

I enjoyed very much your article on "Monticello" in the May-June, 1966, issue of *The Garden Journal*.

Of interest to you, I believe, is a compilation of roses known to have been grown by President Jefferson. One of our members, Mrs. A. Thomas Benzinger, Five Chimneys, Sparks, Maryland, has done extensive research on roses of early American gardens. Enclosed is a copy of Mrs. Benzinger's findings pertaining to roses in the garden at Monticello. This list is included in a manuscript which we plan to publish shortly.

O. KEISTER EVANS, JR.
Executive Secretary
American Rose Society

Jefferson's Order to Prince (A New York nursery) dated December 3, 1791, included these varieties (original at left, explanations indented):

Moss rose
  common pink and red available in England, probably pink form.
Rosamundi
  Rosa gallica versicolor
Monthly rose
  autumn damask *(R. damascena)*
Large Provence
  Greate Holland rose
Thornless rose
  alpine rose *(R. pendulina)*
Cinnamon
  R. cinnamonea, double form probably
Yellow rose
  Austrian yellow *(R. foetida)*
Musk
  R. moschata, shrub rose
Moss Provence
  R. centifolia muscosa multiplex?
*White damask
  white rose of York?

Other roses in Jefferson's Garden Book:
Rosa eglanteria
  wild English briar rose
Crimson dwarf rose
  (described in the article on page 170)
Cherokee
  R. laevigata

*Some authorities claim *R. arvensis* to have been the white rose of York: others, the semidouble *alba.*

I dedicate this poem to the Rose Garden of The New York Botanical Garden.

A June day in the garden of roses,
  Worthy of great acclaim,
Filling the air with their fragrance,
  Delighting the eye within range.

Oh what a haven of refuge,
  Just beyond the city's loud roar,
Providing a spot for observance,
  Of the beauty from culture once more.

There in those tranquil surroundings,
  Devoid of turmoil and strife,
The grandeur of nature inspiring,
  Fills the mind with true meaning of life.

HAROLD LATHAM
Bronx, New York

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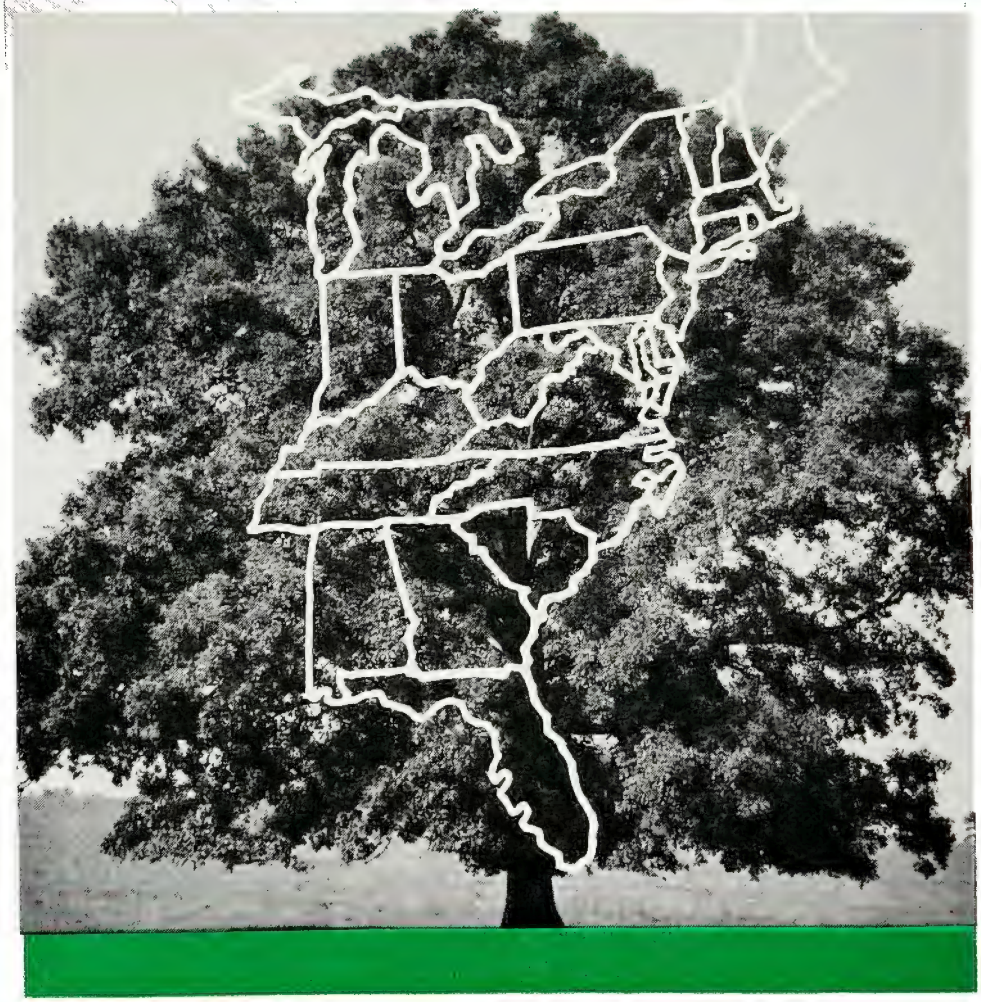

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THE NEW YORK BOTANICAL GARDEN

Volume 16, No. 6 November-December, 1966

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THE GARDEN JOURNAL

DOROTHY EBEL HANSELL, *Editor*

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The display or ornamental garden at the Munich-Nymphenburg Botanical Garden in early summer. In the background are elevated concrete boxes in which plants are grown for ecological or genetical demonstrations. The cafeteria is housed in the building.

THE MUNICH-NYMPHENBURG BOTANICAL GARDEN

By FRANZ SCHÖTZ AND THEODOR PHILIPP HAAS

Professor Dr. Schötz, the Director of the Munich-Nymphenburg Botanical Garden, wrote the text in German, and Dr. Haas prepared it for the American reader. Dr. Haas was formerly with the Munich Botanical Institute and then with the Philadelphia College of Pharmacy and Science in Philadelphia, Pennsylvania. Now retired, he is a resident of Honolulu-Waikiki, Hawaii.

IN 1964 THE Munich-Nymphenburg Botanical Garden, Bavaria, West-Germany, celebrated its fiftieth anniversary in Nymphenburg, its present location. Munich had an earlier botanical garden, which was founded in 1809 and located in what is now nearly the center of the city. Because of the city's growth, it was not possible to continue the garden in its original location; and so, between 1910-1914, under the direction of Prof. Karl von Goebel, it was moved to its present site. It was opened on May 10, 1914.

The original garden covered four hectares[1]. The present botanical garden, situated northwest of the city and close to the Castle of Nymphenburg, covers almost twenty hectares. The site, originally covered with woodlands and meadows, has the advantages of natural landscapes, relatively good climatic conditions, and easy access to the city.

The botanical garden, together with the research and teaching institutes of Munich University which are connected with the garden, is owned and generously operated by the State of Bavaria.[2]

During the construction of the Munich-Nymphenburg Botanical Garden, large quantities of soil were moved, and a particular railroad was used to transport 68,000 cubic meters of field soil, 50,000 cubic meters of loam soil, and 13,000 cubic meters of gravel to the site. A great part of the latter was used in building the rock garden or alpinum, covering about 3,800 square meters.

The outdoor garden is divided into a number of compartments which are linked together without a strict separation. A sunken display or ornamental garden ("Schmuckhof") presents the seasonal beauty of the plant kingdom for a period of about five and a half months— from the middle of May through October.[3] Many German breeders send the finest results of their work, without charge, to be displayed in the botanical garden.

The attractive garden side of the Institutes Building.

The conical, dark evergreens in the heath garden are forms of *Juniperus communis.*

A view of the rock garden where North American plants are grown. Here moss phlox, *P. subulata,* blooms freely.

West of the ornamental garden is the arboretum. This is a parklike area with trees and shrubs arranged from a taxonomical viewpoint and at the same time aesthetically satisfying. Especially interesting are some growth variations or abnormalities of evergreens, mostly of the Norway spruce, *Picea excelsa,* which is native to southern Bavaria.

Close to the arboretum and the rock garden are ecological displays, such as the lovely heath garden and low-moor and high-moor ("Flachmoor" and "Hochmoor"). Low-moor and high-moor ecological conditions are found frequently in glacial southern Bavaria —in the pre-alpine country ("Alpenvorland"). Included in the ecological displays are dunes with the plants that are typical of these sandy ridges.

In the rock garden or alpinum are species from many parts of the world. Because Munich is so close to the Alps, the cultivation of mountain plants is emphasized. There are plants from the mountains of Europe, America, New Zealand, central Asia, and the Far East. Visitors from northeastern United States are delighted to recognize moss phlox *(Phlox subulata),* American columbine *(Aquilegia canadensis),* May-apple *(Podophyllum peltatum),* shooting-star *(Dodecatheon meadia),*

Ostrich ferns, *Pteretis (Matteuccia) struthiopteris*, grow luxuriantly along the road to the fern ravine.

The high, recurved inflorescence of the American *Agave attenuata*, in the middle foreground, resembles a triumphal arc. On the left, *Aloë principis;* on the right, the palm *Erythea armata*—both from Africa. In the background, left, the arborescent *Aloë bainesii;* on the right, *Dracaena draco*, the dragon-tree from the Canary Islands.

Delphinium sp., and mountain-laurel *(Kalmia latifolia).*

At the base of the rock garden is a large pond which has been surrounded by marsh plants and reeds. In it grow water-lilies. The natural treatment conceals the fact that the pond is artificial, serving as the water supply for the botanical garden. The water in the pond, which has a lime content less than that of the water of Munich, originates from the Würm River, the outlet of the pre-alpine Starnberger See lying south of the city. The water is diverted by a canal to the Castle of Nymphenburg; from there it is piped into the garden where it appears as an artificial spring. From the spring the water flows in the form of a little creek and feeds the pond. The area, somewhat depressed and deeply shaded by tall trees and shrubs is called the fern ravine ("Farnschlucht"). Here are cultivated many ferns and other plants which require shade, such as the previously mentioned May-apple and its Asiatic relative, *Podophyllum emodi*. Both are important drug plants.

Connected with the pond is the pump house, the style of which fits its environment perfectly. The water is pumped through a widespread, subterranean pipe system by which the entire botanical garden can be irrigated. Because it has its own water supply, the botanical garden is not dependent upon Munich's water supply system.

The unique beauty of the rhododendron display ("Rhododendron Hain") from late May to mid June is famous. The cultivation of rhododendrons in Munich is rather difficult because of the very continental climate. Only the hardiest species survive. The soil is also very high in lime content; because of this all the soil was removed from the area in which the rhododendrons are planted, and it was replaced by peat and acid soil suitable to ericaceous plants. Even the limestone gravel covering the adjacent roads was removed and replaced by lime-free slag to avoid injury to the plants. (For the same reason a lime-free section was created in the rock garden.) Tall, native pines *(Pinus sylvestris)* on which

Left. The tip of the giant bamboo, *Dendrocalamus giganteus*, touches the nineteen-meter-high cupola of the palm house. In the left foreground is *Trevesia sanderi* from Cochin-China; nearby, *Codiaeum variegatum*, the familiar croton of florists' shops; and, right, the South American *Sanchezia nobilis.*

Victoria cruciana, one of the large water-lilies of northern South America, in the pool of the "Victoria house" at the Munich-Nymphenburg Botanical Garden. Its upright rim is an incomplete unfolding of the leaf. In the foreground are other water-lilies and the sensitive plant, *Mimosa pudica;* the latter is planted in earth-niches.

Left. The tree-fern house was completed in 1964. The large specimens are *Alsophila australis*.

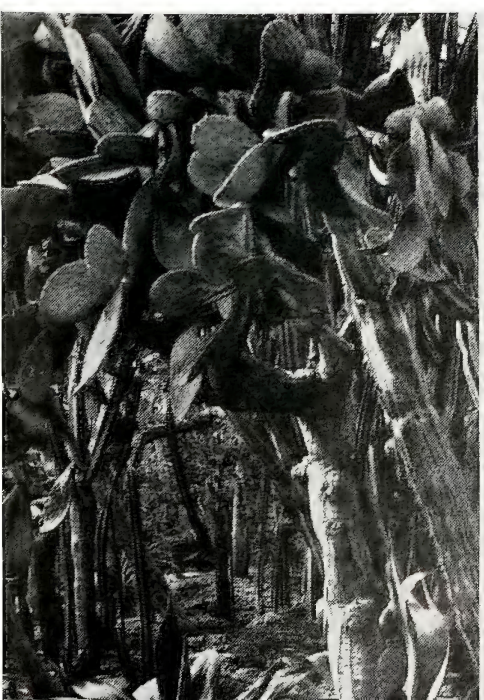
Right. Staghorn-ferns, *Platycerium bifurcatum (P. alcicorne)*, and *P. angolense*, and, in the lower left-hand corner, *Blechnum brasiliense*. These ferns, ephiphytes from tropical, southern Asia, have two kinds of leaves; those growing upward are sterile and may become woody and brown; those growing downward, remain green, assimilate, and produce on their tips the brown spore-containers or sporangia. In many species the fertile leaves are divided like the antlers of deers—whence the common name, staghorn-fern.

species of *Clematis* and *Hydrangea* climb up, protect the rhododendrons from too much light and winter cold.

Different phases of botany are arranged in compartments, which are enclosed by hedges of European hornbeam *(Carpinus betulus)*. In the largest, the systematic or taxonomic compartment, the plants have been placed according to their natural relationships. They bear china labels, indicating both the scientific and common names, the family, and their native habitats. Other important compartments are given over to economic plants, the more common weeds, or are arranged to demonstrate ecology, genetics, and so on. To make it more convenient to study them, small plants and aquatic plants have been placed in elevated concrete boxes.

The conservatories which are open to the public cover approximately five thousand square meters. The central portion comprises two halls, each twenty-five meters long, four meters wide, and eight meters high. The first hall accommodates plants of dry habitats, such as tree-lilies and leaf-succulents; the other hall accommodates stem-succulents, cacti, and euphorbias which are found in American and African deserts. The houses, running in an east-west direction, are connected with each other by the palm house. Thirty-five meters long and nineteen meters high, it contains different kinds of palms, pandanus, giant bamboos, and other tall tropical plants requiring humidity.

To the north and south are twelve lower houses, each of which is twenty-seven meters long. In them are displayed orchids (some eight hundred tropical species being cultivated); economic plants such as coffee, cotton, sugar cane, and drug plants; insectivorous plants, swamp plants (mangrove), and aquatic plants which must have high humidity and temperature—for example, *Victoria regia*, the giant water-lily from the Amazonas. Other side houses contain bromeliads which grow in the American tropics, aroids, tree-ferns *(Cibotium, Cyathea)*, staghorn ferns *(Platycerium* sp.) and a fine collection of cycads, some specimens being over one hundred years old. In one of these side houses which is designated the "coldhouse," and heated very little dur-



Left. Mostly stem succulents are seen, such as the Indian-fig, *Opuntia ficus-indica*, and hedge cactus, *Cereus peruvianus*, in the house devoted to the big succulents. In front is an agave, a leaf succulent.

Right. Here in the African house are cactus-like species of the genus *Euphorbia* of the Spurge Family. They grow under conditions similar to those required by American cacti.

The house of the "Schachen Garden" or alpine garden. The dark, coniferous trees are *Pinus cembra*, the only European pine whose needles are borne in clusters of five.

ing the winter, are plants which grow in the tropics at a higher elevation, where it is cold throughout the year but where there is no snow. *Thea sinensis*, a native of mountainous Assam, is to be found in the "coldhouse."

The greenhouses, built between 1910 and 1912 in accordance with the principles of that day, still fulfill their purpose. In World War II they were partially destroyed by bombs. The damage occurred during the winter, and the plants growing in the greenhouses suffered and died. After the war the houses were rebuilt and regained their original beauty—perhaps they are even more beautiful than before—and two houses were added: the African house containing a remarkable collection of African succulents and the American house in which there are mostly cacti. For the botanical garden's fiftieth anniversary, one of the side greenhouses was torn down and replaced by a new tree-fern house.

There are a number of small greenhouses, to which the public is not admitted. These are used primarily for propagation and cultivation of plants before they are placed on display or for plants which are used for scientific research. In this area there is a small house for alpine plants and one for winter storage of tender plants which are grown outdoors in summer.

Because of its high lime content, previously mentioned, the water from Munich cannot be used for all the plants in the conservatories and greenhouses. Rain water is collected on the roofs of the conservatories and stored in large tanks until required for watering the plants. The climate of Munich is relatively wet, receiving about thirty-five and a half inches of rain annually. Since hail storms sometimes occur in summer, wooden shades have been erected to protect the glass houses from damage—and these shades also protect the plants from too much sunlight. When hail stones fall, they can play havoc in the outdoor plantings.

Associated with the botanical garden in Nymphenburg, which has an altitude of over fifteen hundred feet, is an alpine garden on Mt. Schachen in the Wetterstein Mountains, in the vicinity of Partenkirchen. Here, at an altitude of 6,400 feet, plants are cultivated whose well-being is influenced by altitude and which do not grow well in Nymphenburg. Also in our country, for example, near Tucson, Arizona, the Saguaro cactus *(Carnegia gigantea)* does not grow at an elevation higher than 4,600 feet though nearby there are mountains rising to 9,700 feet. On the other hand, the cushion-forming cacti (*Tephrocactus* sp.) grow in the Peruvian Andes at an altitude of 13,000 feet. These cacti cannot be cultivated in gardens in Lima, Peru, close to sea level and by car only five to six hours away.

In the Schachen there are, furthermore, native alpine plants grown in their natural habitat. Surrounded by the majestic Bavarian Alps, this garden attracts many botanists and plant enthusiasts during the short summer season.

The staff of the Munich-Nymphenburg Botanical Garden consists of four scientists and sixty gardeners. All necessary workshops are located on the grounds, and all maintenance and repairs are undertaken by the garden personnel.

As already stated, the botanical garden is generously supported by the Bavarian Government, but for extraordinary expenses the Gesellschaft der Freunde des Botanischen Gartens München (Society of the Friends of the Munich Botanical Garden) was founded by private citizens to finance improvements which are not covered by the fixed budget. It was in this way that the African and American houses were built.

The Munich-Nymphenburg Botanical Garden with its rich collections is considered one of the most beautiful gardens in Europe and, indeed, within the temperate zone of the world. Only a small entrance fee is charged, and every year about five hundred thousand people from all over the world visit it.

1. One hectare is 10,000 square meters, equivalent to approximately 2.47 acres. One square meter is equivalent to approximately 1.2 square yards. One cubic meter is equivalent to approximately 1.3 cubic yards.
2. Two scientific institutions are housed in the large Institute Building on the Menzingerstrasse, the main street leading to the city. One is the Botanical Institute (Dr. Leo Brauner, Director); the other is the Institute for Systematic Botany, connected with der Botanische Staatssammlung or Botanical State Collection (Dr. Hermann Merxmüller, Director). In the Botanical Institute, a team of scientists, in addition to teaching, engages in research in plant physiology, microbiology, genetics, and so on. There are modern laboratories (since 1959) for radio-isotopes and electron-microscope research (since 1963). The Botanische Staatssammlung with two million specimens is today the largest herbarium in Germany. The scientists derive inspiration from the botanical garden so nearby.
3. The Munich-Nymphenburg Botanical Garden is situated at 48° N.

Among the scenes which are deeply impressed on my mind, none exceed in sublimity the primeval forests undefaced by the hand of man. No one can stand in these solitudes unmoved and not feel that there is more in man than the mere breath of his body.

CHARLES DARWIN

THE HISTORY OF RHODODENDRON POISONING

By DAVID G. LEACH

Mr. Leach, a serious student of the genus *Rhododendron* and the author of *Rhododendrons of the World,* spent two years intermittently in Istanbul, Dubrovnik, London, New York, Washington, Philadelphia, and Pittsburgh in research on the history of the toxicology of rhododendrons.

An abridgement of his manuscript will appear in Johnson and Johnson's *Profiles,* and it will be published in full in the quinquennial yearbook of the American Rhododendron Society.

THE GREEN CLOAK of vegetation which beneficently mantles the earth has some painful traps for the unwary: poison-ivy, stinging nettles, poison-oak, the devil's-walking-stick, and others similarly spined or daggered. These are the obvious malefactors in the generally benign world of plants. And then there are a few deceptive weeds and flowers of innocent appearance which are dangerously toxic if parts of them are eaten. Children are warned to avoid the beckoning blue blossoms, like helmets with beaked visors, on the venomous monkshood, and to shun the black berries which glitter invitingly on the notorious nightshade. But the rhododendron, the dramatically beautiful springtime feature of suburban landscapes, and without evil reputation, has the most lurid past of all.

Rhododendrons and azaleas, both in the same genus of plants, contain one of the most deadly of the world's natural poisons. Its grim history coils back more than twenty-four hundred years. In ancient times the course of western civilization was affected by its lethal impact. In modern times victims of rheumatism and arthritis suffered appallingly for nearly a century after a German experimenter published an erroneous report that an infusion made from rhododendron leaves would cure the diseases.

Ironically, primitive peoples knew the poisonous properties of the rhododendron. The pounded pulp of the leaves was thrown into a pool of water to paralyze fish so that they could be caught on the surface. But the first man in recorded pre-Christian history to be ensnared by the deceptive rhododendron was Xenophon, the brilliant intimate of Socrates, author and military leader. His *Anabasis* describes the retreat from Babylon of ten thousand Greek soldiers of fortune in 401 B.C., after the slaughter of their officers by the treacherous Persians. Trapped deep inside Asia Minor, surrounded by the enemy, the despairing Greeks elected Xenophon to command. Taking a supreme gamble, he led them inland to the mountains of Kurdistan. In deep snows and bitter cold, the starving soldiers fought their way through savage mountain tribes into Georgia and then Armenia.

Two days' march from Trebizond (Trabzon) on the Black Sea coast of Turkey, the army came near to disaster. In Xenophon's own words, ". . . there being great quantities of beehives in those villages, all the soldiers who ate of the honeycombs lost their senses, and were seized with vomiting and purging, none of them being able to stand on their legs. Those who ate but a little were like men very drunk, and those who ate much, like madmen, and some like dying persons. In this condition great numbers lay on the ground, as if there had been a defeat, and the sorrow was general. The next day, none of them died, but recovered their senses about the same hour they were seized: and the third and fourth day they got up as if they had taken a strong potion."

At no time in the retreat had the soldiers been so vulnerable. Had the harrassing Colchian enemy attacked, one of the epics of military history would have become an anticlimax of accident instead of the stirring account of the bravery, endurance, and ingenuity of a determined army through two thousand miles of hardship in hostile lands to final success and reunion with Greece.

Xenophon's anguish, as he faced catastrophe with his soldiers unaccountably stricken after months of battle and privation, was all because of a rhododendron. The honey had been made from the poisonous nectar of the yellow-flowered Pontic azalea, *Rhododendron luteum,* which gilds the hillsides in spring near Trebizond to this day and brings harrowing illness and death to the peasants.

History is full of curious coincidences, and the Roman Empire was later to falter for a time because of the same rhododendron. In 67 B.C., Cicero had supported the transfer of army command from Lucullus to Pompey in perhaps the most skillful of his political speeches. And so Pompey, thirty-seven years old and the Alexander the Great of his day, embarked on a campaign to conquer Rome's ancient and inveterate enemy, the King of Pontus. His adversary was King Mithridates, one of the most formidable intellects and most dramatic personalities of the ancient world. He was an art collector, a magician, a giant of a man, as famous for his strength, courage, and skill with weapons as for his prodigious capacity for food and drink.

The campaign began auspiciously. Pompey's military genius steadily eroded the armed strength of Mithridates until the following year, when three of his armies camped near Trebizond, at almost exactly the same place where Xenophon's exhausted soldiers had stopped to forage for provisions three hundred and thirty-five years earlier. The drama was repeated but with an ending far different, described a few years later by the native historian Strabo in his *Geography*. After eating the poisonous honey the disabled troops were massacred by the Pontic army, and it was to take Pompey three years to defeat Rome's wily enemy. So, to a degree, was the flow of power of the Roman Empire dammed for a time by a rhododendron.

Almost certainly Mithridates knew of the toxic honey produced from the yellow-flowered azalea of the Armenian hills. By a coincidence still more curious, his personal physician was Krateuas, a Greek expert on

plants and their medicinal uses and considered to be the first herbalist of record. His drawings are reproduced in the famous manuscript herbal, the *Juliana Anicia Codex*.

The reason for Pompey's military reverse filtered back to Rome and became part of the lore about the legendary general. A hundred years later the renowned Roman naturalist, Pliny, wrote, "Another kind of honey there is in the same region of Pontus . . . which because it driveth folke into a rage and madnesse, they call in Greek *maenomenon*. Some attribute the occasion hereof to the flower of the rhododendron whereof the woods and forests there be full. The nation selleth no honey at all, because it is so venomous and deadly: notwithstanding they do pay for tribute a huge masse of wax unto the Romans every year."

Dioscorides, a Greek physician in the service of Nero and the renowned pharmacologist of antiquity, whose *De materia medica* was the herbal used by physicians for more than fifteen hundred years, wrote a half century after the birth of Christ. "About Heraclea Pontica, in certain seasons of the year, the honey makes those mad who eat of it; and this certainly proceeds from the quality of the flowers from which it is distill'd. They sweat abundantly, but they are eased by giving them rue, saltmeats and metheglin, in proportion as they vomit. This honey is very acid, and causes sneezing. It takes redness from the face, if pounded with costus. Mixed, with salt or aloes, it disperses the black spots that remain after bruises."

After the invention of the printing press the most useful guide for doctors was still Dioscorides' *De materia medica,* issued in two editions in 1478, about fifteen hundred years after it was first written.

The earliest Renaissance reference to rhododendrons is in *Medendi Ratio* (An Account of Healing) by Paul Aeginetes, published in Latin in Basle in 1538. It is now in the library of the Palace of Rectors in Dubrovnik, Yugoslavia. "Concerning poisoned honey." Aeginetes wrote, "which is produced in Heraclea, those who ate or drank the honey . . . suffered the same unpleasant after-effects as those who took aconite." He was proud to be able to offer an infallible antidote: "A very sound remedy exists in aqua mulsa which is swallowed, an undiluted drink mixed with the leaves of rue." Elsewhere he warned, "The bark of the Rhododaphne tears asunder; this taken internally is fatal."

By 1581 the rhododendron itself was known to be dangerous, at least to herbalists. Maplet, in his *Diall of Destiny,* cautioned. "Rhododaphne which beinge taken inwardly, poysoneth."

In 1700 Joseph Pitton de Tournefort, the most eminent botanist in Europe before Linnaeus established the classification of flora, spent three years in Greece and Asia Minor collecting plants at the direction of Louis XIV. Tournefort was professor of botany in the royal garden, a member of the Academy of Science, and the possessor of one of the most fertile minds on the Continent. It was he who persuaded the scientists of the eighteenth century that stones had life because, he said, "corals and other stony plants were of the same

The yellow-flowered Pontic azalea, *Rhododendron luteum.*

construction tho found in different countries."

As further evidence he reported having seen "in some seashells very hard chalk and in others flint-stones of much larger size than the hole of the shell could admit: I thence infer'd that those substances could not be receiv'd therein anyhow, but when they were liquid or only in their first speck of entity, and that afterwards they must have enlarg'd and harden'd, in proportion as they came to maturity."

Having entered a cave on the island of Candia, Tournefort found further proof in the names of previous visitors carved upon the walls. The names had originally been cut with chisels but were, at the time of his visit, as if embossed in low relief, protruding from the stone. He was sure, therefore, that the stone had callused "in the same manner as it happens to trees whereon any letters have been cut."

In presenting his case before the Academy of Sciences, M. Tournefort produced stones which "had been broken . . . at the time of the rising of their sap; and nature herself had pieced them together again by a solder, which was nothing but a callus form'd by the nutritious juice of those stones, which after having rejoin'd and glu'd the pieces, had cover'd 'em over again for about the thickness of half a line."

"If," he concluded triumphantly, "we have not been able to find the seeds of stones, minerals or metals; that is no reason for denying their existence: since it is certain we have not yet discover'd seeds of mushrooms, truffles or mosses."

Eighteen years after his journey to the Near East his *Relations d'un Voyage du Levant* was published, a vivid recital of his observations and the perils of his journey. In it he weighed the writings of the ancient Greeks and Romans on rhododendrons and added an anecdote of his own: "I thought it [*R. luteum,* the Pontic azalea] so very fine that I made up great nosegays of it to put in the Bassa's tent; but I was told by the first officer of the household that this flower caus'd vapours and dizziness.

I thought he rally'd very pleasantly, for the Bassa complain'd of those distempers. The first officer gave me to understand that he was in earnest, and assur'd me he had lately been inform'd by the natives that this flower was prejudicial to the brain. Those good people, from a very ancient tradition, grounded perhaps upon several observations, maintain also that the honey which the bees make after sucking that flower, stupifies those who eat of it, and causes loathings."

More than two hundred years later the honey produced in the lands surrounding the Black Sea was still an annual scourge. Dr. G. Mosolevsky of Sukhum in Transcaucasia wrote, in 1929, "Cases of poisoning are very numerous, particularly among the villagers in the mountains. Three to four hours after consuming honey suddenly slight vertigo comes on and instantly disappears. It is the first warning of approaching danger. Experienced people usually at once . . . purify the stomach by causing vomiting. If this is not done, after about half an hour a fresh paroxysm of vertigo follows—a much more violent one this time. The succeeding intervals grow shorter and shorter, the paroxysms more and more violent, till you feel that you are deprived of the ability to stand and must hasten to lie down. At the same time one becomes almost blind; the whole field of sight fills with the most intense whirls of bright golden-yellow colour. Some individuals speak of dark whirls."

"The utmost weakening or derangement of the sense or sight is the outstanding characteristic of this process. Considerable weakening of the heart's action can be observed. In the worst cases convulsions occur, sometimes very violent ones; and a long swoon, resulting—if not in death—in the utmost weakness for a long time. Fatal cases occur most frequently among children. As for medical assistance, it is—with our exceedingly impassable roads—merely a distant *pium desiderium.*" Twenty-three hundred years earlier Aristotle, with some justification, had imagined that honey made from the Pontic azalea "depriv'd those of their Senses who eat of it, and were in health before; and that on the contrary, it cured those who were already mad."

In 1768, in St. Petersburg of Imperial Russia, John George Gmelin, a German professor of chemistry and natural sciences who explored Siberia with Vitus Bering for ten years, published in Latin *Flora Sibirica,* which was to bring down upon the Europeans a curse lasting more than a century. He reported that a tea made from the leaves of the Siberian snow-rose was used successfully by foresters in the East to alleviate rheumatic knee pains, and as a restorative after laboring at high altitudes. He was referring to *Rhododendron chrysanthum,* a dwarf species with white or yellow flowers, which grows in the eastern reaches of Asiatic Russia. J. G. Gmelin's book was published posthumously, but his notebooks had been inherited by his nephew, Samuel Gottlieb Gmelin, also a professor and botanist at St. Petersburg, who explored southeastern Russia with another German botanist-author, Peter Simon Pallas, from 1768 to 1773. The nephew passed on to the chief health officer of Stettin in Germany, Dr. Alexander Bernard Koelpin, the information of medical interest that he had found in his uncle's papers.

On October 10, 1776, Dr. Koelpin began treating fifteen of his arthritic patients with tea prepared from dried rhododendron leaves which he had received through Prof. Pallas from Siberia. With German thoroughness, he kept a daily diary. His first patient drank two ounces each morning for the first twelve days with no effect. On the thirteenth day he was given four ounces without result. On the fourteenth day the amount was increased to eight ounces. Within two hours the sixty-eight-year-old patient was violently ill and in a short time he lost consciousness. . . By late afternoon the patient was normal, except for a feeling of constriction in his chest.

On the fifteenth day the patient continued to complain of tightness in his chest and the following day he had severe diarrhea. By the seventeenth day the chest pain was so piercing that the wretched patient described it in terms of a wood-chopper flailing rhythmically with an axe beneath his breastbone. Koelpin decided to reduce the daily morning tea to two ounces; even so, the chest pain persisted.

Rhododendron chrysanthemum, a dwarf species from Asiatic Russia.

For the next several days vomiting was so violent that Dr. Koelpin discontinued the medication, whether by necessity or out of consideration his diary does not note. The patient was then told to resume the morning tea at eight o'clock. By ten he was nauseated, the tightness in his chest was severe, breathing was painful, he went into convulsions, and a short time later lost consciousness. When he revived late in the afternoon, the base of his palm was numb and remained so until the next day.

On October 27th, seventeen days after the treatment was started, the patient reported that his arthritic pain had disappeared and that he was comfortable except for the tightness in his chest. The morning tea was continued, but a few days later his pulse slowed alarmingly. He felt intoxicated and by the end of November was near unconsciousness again, with a halting, irregular pulse and excruciating pain beneath his breastbone. During December the patient's breathing became so slow that he was near suffocation. Dr. Koelpin prudently

(Continued on page 239)

Japanese hill-and-pond garden at the Brooklyn Botanic Garden. Center: island with snow-viewing lantern and drum bridge connecting with "mainland." Distance: Torii ("Gateway to Heaven"). Shinto Shrine, which is always near a Torii, is out of sight on the hill at right.

GARDENS IN JAPAN: ANCIENT IN THE EAST, MODERN IN THE WEST

By GEORGE S. AVERY

Dr. Avery is Director of The Brooklyn Botanic Garden.

IT CAN HARDLY BE SAID that a wave of popular interest in Japanese gardens is sweeping across America. What can be said is that since World War II, Japanese gardens have once again come to the attention of our western world and are attracting considerable interest.

Students of the garden arts, amateur and professional alike, are discovering in Japanese gardens a new dimension, one which is likely to have a deep influence on the future of American gardens. It is a philosophical dimension, which awaits discovery by those who seek something other than masses of color and continuous bloom in their gardens, something other than formal design and extensive collections of exotic plants. The "something other" is surprisingly simple—nature itself in its own inviting asymmetry.

As interest in Japanese gardens has grown, many gardeners have bought stone lanterns, perhaps small busts of the Buddha, and a small stone pagoda or two—and placed them in their gardens. The objects may indeed be of Japanese origin, but no one should labor under the delusion that their presence alone makes a Japanese garden.

For those who would fully appreciate—or construct—a Japanese garden, there are three key words, a mastery of which will pave the way to understanding. These are *esthetics, finesse,* and *restraint.* The first has to do with the science of the principles of art—the SCIENCE OF THE BEAUTIFUL, the second with DELICACY OF EXECUTION, SUBTLETY OF DISCRIMINATION, REFINEMENT, and the third with CONTROL, CONTAINMENT, MODESTY, TRANQUILITY. Once these meanings are imbedded, in one's thoughts, the beauty and simplicity of Japanese gardens will be understood. The rocks, water, hills, and plants of the natural landscape were the essence of Japanese gardens a thousand years ago. They are no less so today.

The oldest garden in Japan which is recorded in the literature was that of Sogano Umako. Yoshinaga tells us that nearly 1,350 years ago, Umako built his new house on the Asuka River in Yamato Province, Nara Prefecture. It was surrounded by a garden with a small pond and island. Within a century of Umako's time, other gardens were constructed—with hills and ponds with skillfully arranged rocks symbolizing the scenic beauty of the seashore. Such were the beginnings of naturalistic gardening in Japan.

A moment of disgression is in order here, for Richardson Wright has given us a brief and superb sketch of historical events in Japan which led to the flowering of Japanese culture—of which gardens were such an important part. It was the introduction of Buddhism to Japan in about the fifth century A.D., and the broad sweep of Chinese culture which accompanied it, that also brought gardens. The Zen sect of Buddhism, a

philosophy of East Indian origin, reached Japan during the magnificent Kamakura Period (1186-1335), and it was during this time and two centuries or so which followed that garden art flourished, along with landscape painting, flower painting and arranging, sand pictures (bonseki), and the *Noh* drama. The Tea Ceremony was developed by priests of the Zen sect during this period. Richardson Wright comments that the Tea Ceremony grew into a national sacrament devoted to "the admiration of the beautiful in the sordid facts of everyday life." He further observed that it became an essential factor in splendid old feudal Japan and even today stands as a national symbol which patriotic Japanese evoke to offset the disintegrating influences of Western customs. Around its ritual grew up a code of ideals which in turn affected both garden design and the enjoyment of gardens—a true feeling for nature.

Of the three historically most important types of Japanese gardens, the *hill-and-pond gardens* are both the oldest and most widely appreciated. They are gardens which typify the varied natural landscapes of Japan, but in condensed and simplified form. To convey the feeling of great space within a limited space is one of their secrets, but nature remains their basic subject matter. The art of perspective, carried out in part by using the pruning art to keep even old trees small, made a garden landscape appear larger than it actually was. But there also had to be special qualities in the heart and mind of the viewer to give a garden deeper meaning.

"Reverence for nature," writes Takuma Tono, "is one of the outstanding racial traits of the Japanese people, and guidance by nature's revelation provides a way of life in which nature is both important and precious to all Japanese." He goes on to say that the fundamental aim of landscape gardening in Japan rests primarily upon *viewing, instructing,* and *consoling*—"gardens are intended to break the connection with the outside world, so to speak, and to produce a fresh sensation conducive to full enjoyment of estheticism in nature." Thus, one philosophical concept of an ideal Japanese garden is that it should be a retreat for leisure hours of contemplation and meditation. Within it there should be the added dimension of living symbolism, a language all its own; for example, the pine tree is a symbol to the Japanese of long life, while the plum blossom suggests courage, and the bamboo perserverance. Artificial features usually added to hill-and-pond gardens, as well as other types, include stone ornaments such as lanterns and water basins. But the essential elements of such a garden are its "skeleton" of stones—chosen for their intrinsic beauty and symbolism, its hill or hills, its pond and in-flowing stream, its island, paths, and stepping stones, garden gates and bridges, clipped hedges, and its studied positioning (and continued pruning and shaping) of individual trees and shrubs. Finally, the whole is enclosed by the customary high fence.

Lawns were unknown in the earlier gardens; mosses or just hard clay made up the flat expanses.

Flowers, *per se,* are of lesser importance in traditional Japanese gardens, not that the Japanese do not love flowers—they do; but they use them with restraint in creating garden landscapes. Flowers are ephemeral elements in a garden, while evergreen trees and shrubs make a continuing contribution to the strength of the landscape throughout the year. A green garden symbolizes long life. Thus such Japanese gardens are essentially monochrome, and if this is not understood in advance, it can be disappointing to foreign visitors in Japan. Professor Tono tells of conducting a group of Americans to some of their more important gardens. After the first day of the tour, one lady inquired . . . "but when are we going to start seeing gardens?" She apparently was disappointed not to find a blaze of color and symmetrical design.

A second historically important type of garden—the *flat garden,* apparently had its beginnings at least five

The cascade, echo caverns, quiet pool, and shaped and dwarfed trees in the Japanese hill-and-pond garden at the Brooklyn Botanic Garden.

hundred years ago. Conder tells us that "the same tranquil and prosperous times which helped so much to advance the sister arts of poetry and calligraphy, and which first stimulated the cultivation of the tea ceremonial, also brought patronage to the art of the landscape gardener." It was a period of the popularization of landscape gardening. Buddhist priests, masters of the Tea Ceremony and purveyors of culture generally, were the great garden designers; temple grounds afforded space for their practice. And thanks to them, it is chiefly around the temples of Japan that the classical gardens have been preserved. Centuries old, many have been designated as National Treasures. Best known of the flat gardens is the stone garden of the Ryoanji Temple (Temple of the Tranquil Dragon) in Kyoto. The original temple was burned to the ground during one of Japan's many civil wars, but after being reconstructed toward the end of the fifteenth century, a Stone Garden was built by its side—to be viewed from a veranda wing of the Temple.

The Ryoanji garden is an abstract garden composition and has no plants other than little tufts of moss which grow around the stones. About the size of a modern tennis court, and closed in on three sides by a low, roofed wall, its level area is a bed of what appears to be coarse sand, skillfully ripple-raked to suggest the sea. Seen from the viewing wing of the Temple, its key points "for contemplation and meditation," are fifteen stones—in five groups; no two stones and no two groups are alike. To compare the garden of Ryoanji with traditional gardens of the West is like comparing an abstract painting with traditional art. They are simply different.

There are other flat gardens of historic significance, but Ryoanji remains the masterpiece. Its symbolism has been variously interpreted. One view is that it represents a limitless sea with islands rising in it. A modern-day author regards it "a sermon in stone which speaks to man of his intimate relationship with nature." Whatever interpretation may be given the Ryoanji garden, its beauty and meaning are in the eye of the viewer. He will take away with him whatever he has put into it. A distinguished American architect speaks thus of Ryoanji . . . "it is deceptively simple in design, but this is what gives it power. I have never seen anything to match it in perfection of scale."

Those who long for plants in a Japanese style flat garden may have them. There are many such in Japan. One of the most revered is the Moss Temple Garden (Saihoji, also in Kyoto) where, except for trees and occasional shrubs, the only plants are mosses. It is a woodland garden of subtle moods, depending upon the weather. To view it in the rain is an unforgetable experience. A modern "hybrid" between the gardens of Ryoanji and Saihoji is to be found in other temple gardens in Kyoto, and at the Tenman Shrine, Dazaifumachi, on the Island of Kyushu.

The third historically important type of Japanese garden is small and intimate—the *Tea Ceremony garden*. It must convey the feeling of simplicity and seclusion, and is especially designed to foster the meditative spirit. It, too, is a flat garden, enclosed with a tight, high above eye-level fence. A small tea house is attached. Stepping stones, low-growing shrubs, a rustic lantern, water basin, and a tree or two complete the picture. Professor Tono points out that as guests for a Tea Ceremony "pass slowly from one stepping stone to another, with the garden scrupulously clean and watered beforehand," they "cannot remain indifferent or unsusceptible to the beauty of nature, enhanced by the art of the landscape gardener."

Many contemporary gardens in Japan are simply variations of those described and illustrated here. Some are inspired by another classical type of garden, which features "dried-up water scenery." These were first designed by Zen priests and date back at least five hundred years in Japanese history. They feature simulated water courses strewn with sand, pebbles, and boulders—and often lakes. While always without water, they convey

The replica of the Ryoanji Temple stone garden in the Brooklyn Botanic Garden. *Life Magazine* (New York Extra Section, August 30, 1963) commented, "How lovely the ungreen garden."

The flat garden (sand and moss) at the Chishaku-in Temple. This type of garden apparently had its beginnings five centuries ago.

the feeling that water was once there or will again bubble over the sand and pebbled course. This exercise in imagination is one of the fundamental concepts in Zen thought.

Whether a Japanese garden is of one type or another, if situated where a distant view of mountain, forest, or sea can be brought into the composition, as a backdrop, this enhances the feeling of space and beauty. "Borrowed scenery" is the phrase for it.

What conclusions can we of the West draw from this brief account of Japanese gardens? It seems fair to say that our woodland gardens are in the same spirit as most Japanese gardens which feature the natural landscape. We have simply failed to gain the philosophical dimension. And without this, how could we hope to have our gardens mirror nature, and reduce them to human scale? Our national reverence for mountain and valley, forest and grassy plain, desert and stream is growing—in terms of understanding the importance of space and conservation of the wild—but most of our people are insensitive to the spiritual riches nature offers. It is here that I think naturalistic Japanese gardens will have their greatest impact on the gardening art in American life. And as for the abstract gardens, such as Ryoanji—with growing interest and at least partial acceptance and understanding of abstract art in America, we no longer find these gardens quite so exotic and alien. Zen priests in their hours of meditation (and sometimes creative thought) gave Japan such gardens five centuries ago. Contemporary Zen scholars hold that many such gardens represent the best in abstract art. They can be utilitarian, but also have important philosophical dimensions. They offer a worthy challenge to garden thinking and planning in the West. Whatever our personal opinions, it is important—collectively—to keep our gardening minds open to treasured cultural developments from all over the world.

BIBLIOGRAPHY

Conder, Josiah: Landscape Gardening in Japan. Dover Publications, Inc. New York. 1964. (Originally published in 1893; second edition, revised, in 1912.)

Tono, Takuma: A Secret of Japanese Gardens. Tokyo, Japan. 1958.

Wright, Richardson: The Story of Gardening. Dover Publications, Inc. New York. 1963. (Originally published in 1934.)

Yashiroda, Kan (ed.): Dwarfed Potted Trees; the Bonsai of Japan. Brooklyn Botanic Garden Handbook #13 (*Plants and Gardens,* Vol. 9, No. 3, 10th printing, 1966.)

Yoshinaga, Yoshinobu. Japanese Garden Art. *(manuscript)*

Although it is not plainly visible to the eye
That autumn has come,
I am alarmed by the noise of the wind!

FUJIWARA NO TOSHIYUKI

The deer which lives
On the evergreen mountain
Where there are no autumn leaves
Can know the coming of autumn
Only by its own cry.

ONAKATOMI YOSHINOBU

Plate 1. An aged specimen of *Ilex aquifolium.*

Plate 2. *Ilex verticillata* in a shallow container.

Plate 3. *Ilex serrata* in winter.

HOLLIES FOR BONSAI AND THEIR USE IN JAPANESE GARDENS

By MAX B. ROLLAND

Mr. Rolland is Head Groundsman of the Department of Horticulture and Forestry, Rutgers–The State University, New Brunswick, New Jersey.

AMONG THE MANY KINDS of trees and shrubs suitable for bonsai, holly with its many species and varieties can have an important place in any collection. I believe the reason more of the hollies are not used is that most people tend to think of them only as stately, pyramidal specimens, as in the case of *Ilex opaca* or *I. aquifolium,* or as material for hedges or foundation plantings, as in the case of *I. crenata.* There are about five hundred species of holly throughout the world. Here at the Experiment Station, there are many species to be seen; also approximately one hundred varieties of *I. crenata.*

The following are a few of the hollies which are suitable for bonsai: *I. aquifolium, I. cornuta, I. crenata, I. decidua, I. opaca, I. pedunculosa, I. pernyi, I. serrata, I. verticillata, I. vomitoria,* and *I. yunnanensis.*

In Japan, as in this country, bonsai are publicly exhibited twice a year—in the spring and in the fall, but each plant is enjoyed during different times of the year for its varying attributes. These may include the new growth emerging in the spring, the summer foliage, fall coloring, fruit, bark color and texture, or during the winter months the line of the trunk and rammification of the branches.

Plate #1 shows an excellent specimen of *I. aquifolium* with its aged slanting trunk, its gnarled branches and full fruit set.[1]

A different feeling is gained from *I. verticillata* in Plate #2. Here the multiple gray trunks rising from a knoll, with the main roots exposed and red fruit on the branches, would be hard to beat when planted in a low, blue, shallow container.[2]

Plate #3, an *I. serrata* in winter, is from the collection of the Brooklyn Botanic Garden.

Nursery-grown stock is, I believe, by far the most satisfying to work with. The plants have already undergone basic root pruning, especially if they are "canned" stock. Working with seedlings does bring rewards, in that they can be trained to whatever shape you desire, but the time element involved is longer.

Important points to look for are: interesting or tapered trunks, low branching, with the idea in mind of keeping certain of these branches and removing others

Plate 4. *Ilex crenata,* about forty-five years old, planted on stone.

Plate 5. *Ilex crenata* pruned to a flat plane.

Plate 6. Another specimen of *Ilex crenata,* peony-pruned.

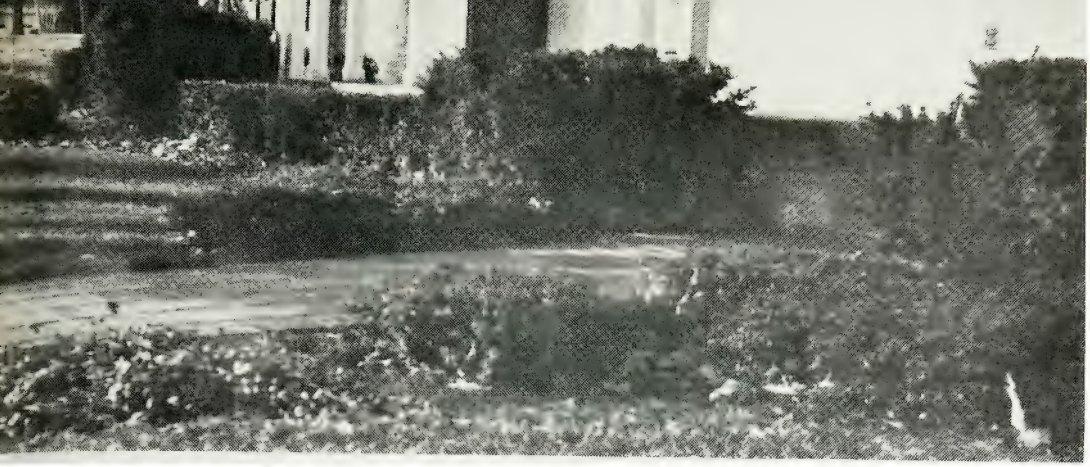


Plate 7. *Ilex crenata* sheared to different levels and used as a foundation at the front of the house.

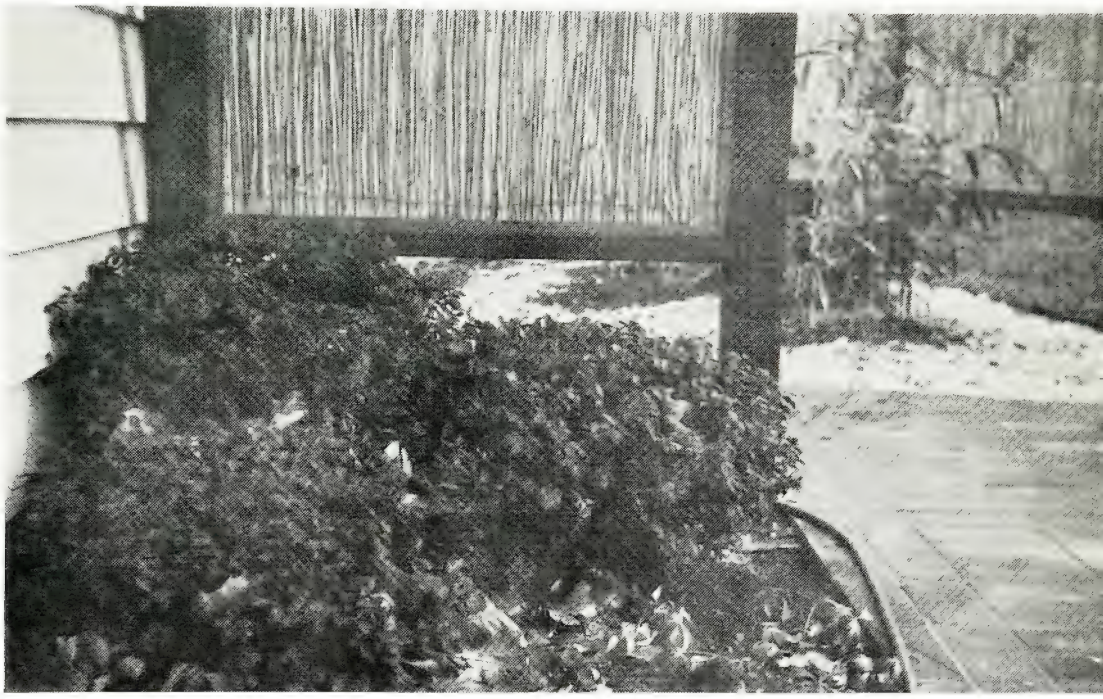


Plate 8. Here *Ilex crenata* has been sheared to three different levels to tie the fence to the house and to serve as an introduction to what may lie beyond the gate.

so that the main lines of the tree are already established. You can determine the amount of drastic pruning required and the estimated time for such a branch to develop the desired amount of twigginess. The top is of secondary importance because with time it will fill in.

The plant left in the ground will increase in trunk diameter, whereas in a container the increase from year to year is hardly visible. The only disadvantage is that the tree is not in your collection. Large branches are pruned so that the cut is concave. Drastically pruned material is acceptable at exhibitions only when these cuts have healed to the point that the surface is even with the surrounding area. Many times the scars add interest to the trunk.

Plate 9. *Ilex crenata*, planted along the stream on its way from the waterfall to the pool, here simulates stone.

Bonsai, when grown in shallow containers, require almost daily watering during the summer; if grown on a rock, they will require water as often as three times a day.

Wire, if used, is applied during the first of June, but hollies are trained primarily by pruning.

Fertilization is done at half strength every two weeks during the growing season. "Atlas Fish Emulsion" or "Bovung" in a solution of one part to ten parts are the two I prefer.

Pruning of new growth is done during the first two weeks of June, allowing two or three leaves to remain.

The potting soil recommended for holly by one bonsai expert is: five parts subsoil, two parts topsoil and compost mixed, three parts sand. The subsoil and topsoil are sieved through a series of screens, 5/8, 1/2, 1/4, 1/8, and 1/16 inches. What remains in the top screen is discarded. The material held by the 1/2-inch screen is used as drainage material, the material held by the 1/4 and 1/8-inch screen are mixed with sand as the potting soil, and that which is in the 1/16-inch screen is used as a thin layer for top finishing. All that

Plate 10. *Ilex crenata* effectively anchors the natural stone bridge to earth.

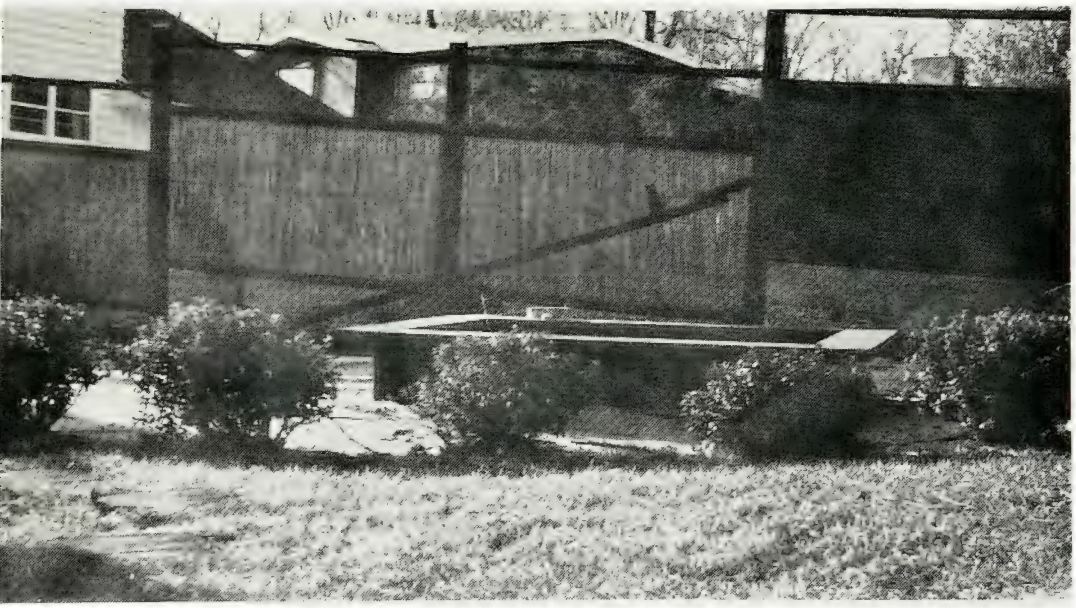


Plate 11. *Ilex crenata* serves as a line of separation, partially enclosing the play area.

passes through the 1/16-inch screen is discarded.

When potting, the soil should be dry but not powdery. Chopsticks or their equivalent are used to firm the soil. It is almost impossible to overpot; and also, almost impossible to overwater because of the exceptional drainage.

As an evergreen, *I. crenata* offers the greatest variety. The favorite tree in my collection is a crenata planted on a stone. The trunk is about four inches in diameter and I believe the tree to be about forty-five years old. Plate #4 shows this tree on a modern terrace serving as a transition element to bring together a Japanese-type garden and a modern home.

The pruning of holly in Japanese gardens follows primarily the techniques of bonsai.

Josiah Condor in his book *Landscape Gardening in Japan,* published in 1893, again in 1912 and 1964, lists the following hollies to be found in Japanese gardens: *Ilex crenata, I. integra, I. rotunda, I. latifolia, I. crenata fulva-marginata, I. crenata alba-marginata, I. sieboldii, I. serrata, and I. pedunculosa.*

Winter-blooming or peony pruning, wherein the foliage is pruned to a flat plane, is greatly used. These foliage masses are primarily for collecting newly-fallen snow. An example is shown in Plate #5. This *I. crenata* is the same age as that shown in Plate #4. Plate #6 shows a specimen of *I. crenata* in the Japanese Garden of the Brooklyn Botanic Garden. It has had many more seasons of pruning to produce this beautiful effect.

In addition, *I.* crenata is sheared in low mounds. A great deal of natural weathered stone is used in Japanese gardens and the crenatas serve in some cases as stones and in others as transition points to other plant material. Plates #7, 8, 9, 10, and 11 show how *I. crenata* may be used.

I have found that *I. opaca,* which has been killed back to the bottom whorl of branches, makes up very nicely into a low, sheared mass. Its inclusion in a landscape gives an additional texture.

1. Yuji Yoshimura and Giovanna M. Halford: The Japanese Art of Miniature Trees and Landscapes. Charles E. Tuttle Co., Inc., Rutland, Vermont, 1957.
2. Lynn R. Perry—Bonsai: Trees and Shrubs—A Guide to the Methods of Kyuzo Murata. Copyright © 1964. The Ronald Press Co., New York.

PRIMARY METHODS IN HYDROPONICS

By RICHARD M. KLEIN

Dr. Klein is Alfred H. Caspary Curator of Plant Physiology at The New York Botanical Garden.

PLANTS, LIKE ALL other living things, require certain minerals, and successful "gardening without soil" provides plants with these minerals in proportions which allow their efficient utilization. Since we know that some plants grow better in one soil than in another, it is logical that different plants show different requirements for minerals. For this reason, scientists have developed many hydroponic solutions. Although these variants have scientific importance, they all contain the same mineral elements, even though the chemical form in which the elements are supplied may be different and the proportions greatly varied. Many plants grown in solution culture will do fairly well with either of two different mineral nutrient solutions, as will most of the commoner plants grown for flowers or for the table.

In addition to being instructive, hydroponic cultivation of plants can be carried out in the gardener's doldrom period during the winter. Small vegetables, such as tomatoes and peppers, as well as annual flowers can be grown to maturity in a cool basement under lights.

Based on an arbitrary scale of quantities needed, the mineral requirements have been divided into major and minor, also called bulk and trace elements. This does not mean that elements in the major group are more important than those in the trace group. All of them are needed, but the major elements are needed in larger amounts.

The so-called major elements include hydrogen and oxygen, which are obtained eventually from water, and carbon, which is taken up as carbon dioxide from the air. Nitrogen, sulfur, calcium, magnesium, potassium, and phosphorus are the primary major elements taken from the soil. The plant cannot use these elements in their uncombined form but takes them up from the soil as salts. Thus nitrogen and potassium, when combined chemically into potassium nitrate, are readily absorbed and used. Sulfur is usually in the form of sulfate, phosphorus is usually in the form of phosphate, and calcium is provided as the sulfate or the nitrate salt. There is absolutely no difference between a molecule of potassium nitrate supplied in organic material.

Among the minor or trace elements, five are most likely to be needed—iron, zinc, copper, boron, and manganese. There are about ten required trace elements, but the others are usually found in sufficient quantities as impurities in even the best grade of chemicals so that, except for special purposes, they are of academic interest only. The trace elements, like the major elements, are provided as salts.

It is generally true in biology that if a little is good, a lot is not necessarily better. As is well known, too much fertilizer will injure plants, causing "burning" of lawns, and so on. The concentration of minerals used in hydroponics must be controlled very closely—even more closely than fertilizer—because there is no soil to soak up excesses or to make up deficiencies. In short, never guess at the proper concentration of a nutrient solution; have it weighed out exactly and dissolve it in exactly the required amount of water.

There are three major factors in successful hydroponics—the nutrient solution, the growth containers, and the condition of growth.

THE NUTRIENT SOLUTION

As indicated above, one of two formulas give excellent results with most common plants. One of the best is Knop's, developed over fifty years ago. It is a four-salt formula for the major mineral elements:

Potassium nitrate [KNO_3]	4 gram
Magnesium sulfate [$MgSO_4$]	4 gram
Potassium phosphate [K_2HPO_4]	4 gram
Calcium nitrate [$Ca(NO_3)_2$]	4 gram
Final amount of water	1 gallon

Each of these salts (obtainable at most drug stores) is weighed out by the druggist and dissolved separately in a pint of water. If the water is chlorinated, allow it to stand for a week to allow the chlorine to evaporate, or boil it. Mix the solution of salts in the order given (this prevents precipitation) and make up to one gallon with

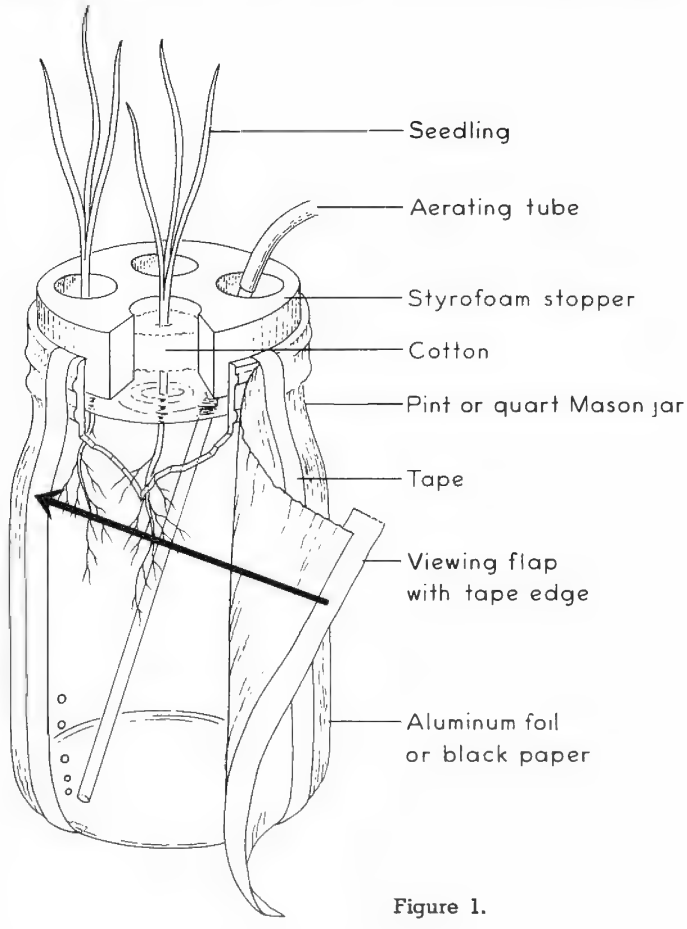


Figure 1.

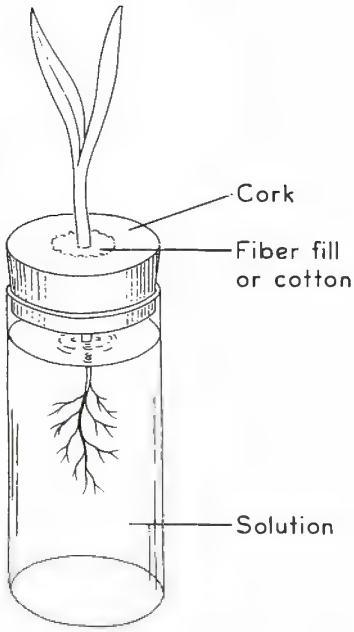


Figure 2.

water. Store in opaque bottles such as well-washed one-gallon chlorox containers. To this add twenty drops of the trace element solution (given below) and the nutrient solution is ready for use.

A somewhat more sophisticated nutrient is called a five-salt mixture and seems to be somewhat better for flowering and fruiting:

Calcium sulfate [$CaSO_4$]	1.0 gram
Calcium phosphate [$Ca(HPO_4)_2$]	1.0 gram
Magnesium sulfate [$MgSO_4$]	1.0 gram
Sodium chloride [NaCl]	0.4 gram
Potassium nitrate [KNO_3]	2.1 gram
Final amount of water	1 gallon

The same procedure of weighing and dissolving is followed, and the same trace element solution is added.

Trace Element Solution

The trace element solution must be made carefully and used carefully. If the minerals are too dilute, growth will be poor; if too high, the plants can be stunted or killed. The stock solution of trace elements can be made up and stored for several months, so long as it is not subjected to direct light. Pint chlorox bottles are excellent for storage.

Boric acid [H_3BO_3]	1.0 gram
Manganous sulfate [$MnSO_4$]	0.5 gram
Zinc sulfate [$ZnSO_4$]	0.5 gram
Copper sulfate [$CuSO_4$]	0.5 gram
Sodium molybdate [$NaMoO_4$]	0.2 gram
Iron tartrate	2.0 gram
Final amount of water	1 pint

Again dissolve each ingredient separately in about an ounce of water and add together, with stirring, in the order given. Make to one pint. Sodium-iron-EDTA, a special metal-organic form of iron is sold under the trade name of "Sequestrene Iron" by the Geigy Corp. of Ardsley, New York, and is a better source of iron than the iron tartrate. It can be used in the same proportions.

Making life almost too easy, the Hydroponic Chemical Co., Inc., (Copely, Ohio, 44321) manufactures "Hyponex" 7-6-19, All Purpose Plant Food, which can be used for hydroponic cultivation at a concentration of two teaspoonsful per gallon of water. Major and trace elements are included. Do not use the 20-20-20 "Fertilese Soluble Plant Food," a product usually found in florists' shops and dime stores.

Systems and set-ups

For convenience, the methods of growing plants in nutrient solutions can be divided into two major types: water culture and aggregate culture. Each has advantages and disadvantages.

In water culture methods, the nutrient is put in a glass, plastic, or ceramic container, and the plants are held above the liquid with the roots dipping into the nutrient (be sure that light does not strike the roots directly.) The container can be of any convenient size from quart mason jars (Fig. 1) up to huge tanks. The item of importance is the method of suspending the plants above the solution. One of the neatest is a block of "Styrafoam," one half-inch thick, into which holes, one half-inch in diameter, are drilled. The seedlings are placed in the holes, with fiberfill batting to hold them firmly in place. Lacking this, sheets of cork (Fig. 2) or other water impermeable material can be used. Even cardboard, well impregnated with paraffin wax (canning wax melted in with a warm iron) can be used. Although this method is easy to set up, it is somewhat difficult to hold large plants upright.

The aggregate culture method is also commonly used. The substrate can be coarse building sand, fine gravel, cinders, or coarse vermiculite. Mixtures of these materials (sand/gravel or cinders/vermiculite) may be better than any one alone. Make sure that they are very well washed to remove any potentially toxic substances. The aggregate is placed in a waterproof tank which may be of almost any desired size. For modest set-ups, plastic wash basins are excellent (Fig. 3). Do not use metal containers, except for stainless steel, unless they are internally coated with epoxy or asphalt paint; galvanized metals contain toxic levels of zinc, and copper

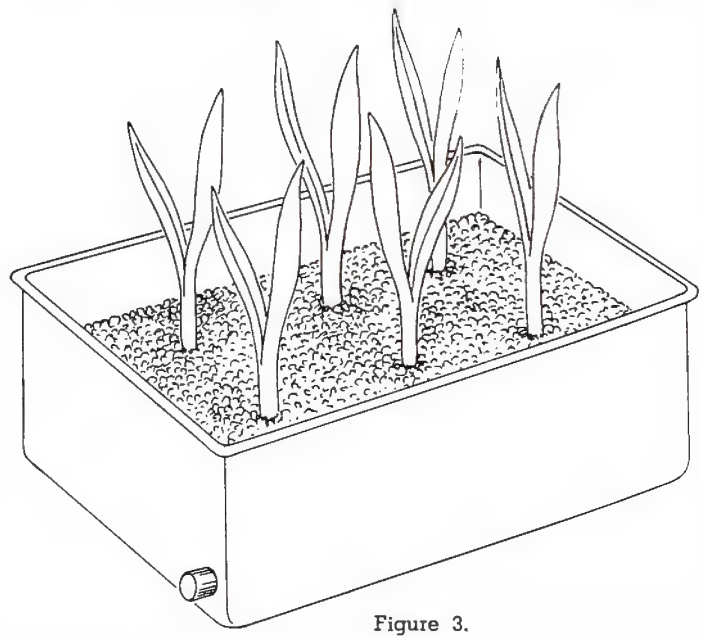


Figure 3.

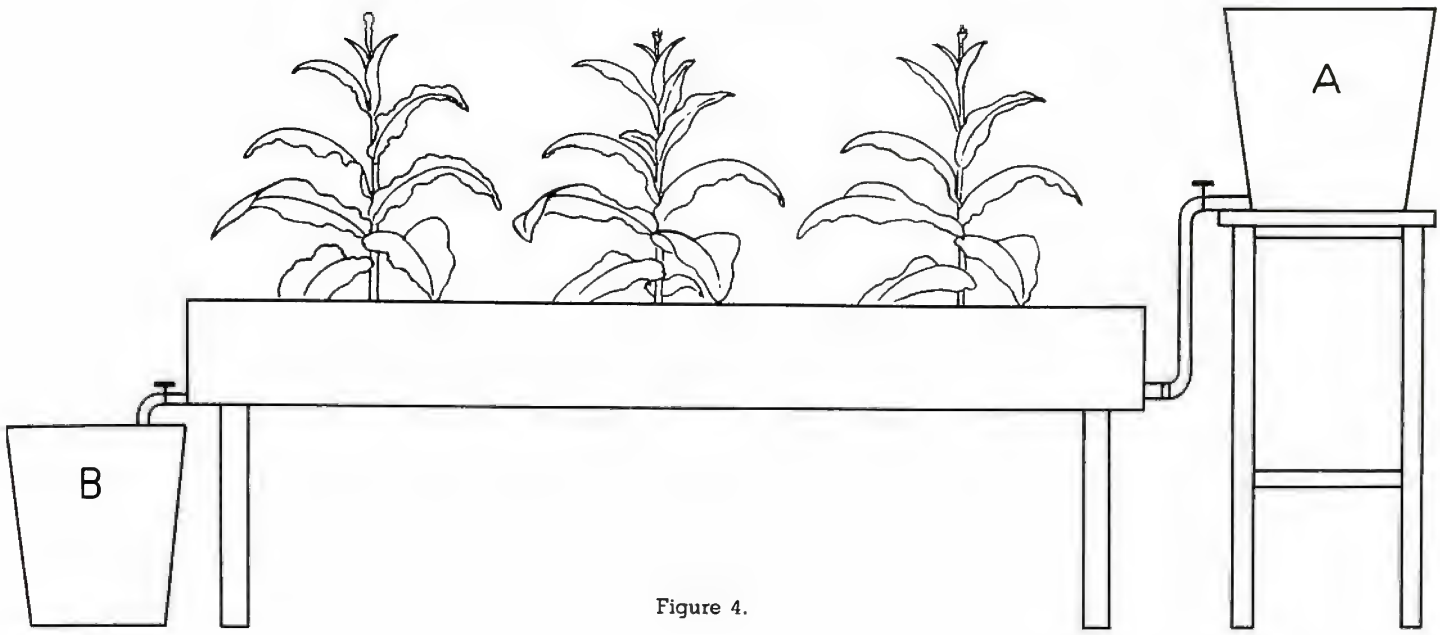


Figure 4.

containers may also be toxic. A hole should be drilled in the side or bottom of the container to drain off the overflow of nutrient solution which can be saved and reused (see below). A piece of aluminum screening or cloth can cover the hole from the inside, or a cork stopper can plug the hole. The seedlings are planted directly in the aggregate. Although the aggregate method is somewhat bulkier and more expensive, it is easier to handle once set up.

Figure 4 shows a more elaborate aggregate set-up. The tray of wood, which has been waterproofed with marine paint (not the copper-containing antifouling paints) or lined with polyethylene sheeting, should be at least ten inches deep.

Conditions of Growth

When plants are grown directly in liquid medium, there is danger that the roots will not receive sufficient air for their growth. This danger may be overcome by bubbling air into the jar (Fig. 1) through an inexpensive aquarium pump connected by rubber tubing to the jar. Try to prevent the water from bubbling furiously; a small trickle of bubbles is all that is needed. In sand or gravel culture, additional aeration is not required.

The nutrient solution is gradually used up as the plants extract what they need from it. For liquid cultures, fresh nutrient solution must be supplied at about one-week intervals. When aggregate cultures are used, the nutrient solution is poured through the substrate every second or third day and the run-off collected. The run-off may be used about four to five times before it, too, should be replaced with fresh solution. At the time the solution is replaced, it is a good idea to flush the aggregate thoroughly with water to remove any accumulated salt.

Good horticultural practice is probably more important in the hydroponic cultivation of plants than for soil-grown plants, because the plants are usually more susceptible to injury. If insecticides and fungicides are needed, the plants should be treated in a fashion which prevents any of the spray or dust compound from remaining in the liquid or aggregate. A thorough flushing with water is advisable after spray or dust treatments.

Adequate light is, of course, necessary. If the hydroponic set-up is to be outdoors or in a greenhouse, no special problems are encountered except to make sure that the substrate does not dry out. When the set-up is indoors, the plants should be supplied with enough light for a sufficiently long period of time. A fourteen- to fifteen-hour "day length" is good. Information on artificial lighting can be found in the book by Elaine Cherry, *Fluorescent Light Gardening,* Van Nostrand Co., Princeton, New Jersey and other similar books. The two-part article in *The Garden Journal* (July-August and September-October, 1966) can be consulted.

Temperature control is sometimes a problem, and particularly in bright sunlight or under incandescent lamps. High temperatures should be avoided by using fluorescent lamps as the primary source of illumination or, if sunlight is used, by shading the plants during the period of peak heating. A reasonable test of whether the temperature is too high is to see if the plants wilt during all or part of the day. Additional water may be needed, but use it sparingly!

There is a tendency for plants grown hydroponically to be somewhat more succulent than those grown in soil. It may be necessary to stake or otherwise hold the plants in such a way as to prevent stem break. This is particularly true for plants, such as tomato, where fruit load may be heavy.

Additional Readings

There are many available publications on hydroponics. Among the better ones for the beginner are:

Gericke, W. F.: The complete guide to soilless gardening. Prentice Hall, N.J.

Ticquet, C. E: Successful gardening without soil. Chemical Publ. Co., N.Y.

Ellis, G. and W. Sweeney: Soilless growth of plants. Reinhold, N.J.

Rutler, J. D. and N. F. Oebker: Hydroponics as a hobby. Circular 844, University of Illinois, Urbana, Ill.

Kiplinger, D. C.: Growing ornamental greenhouse crops in gravel culture. Ohio Agric. Exper. Sta., Special Circular **92,** Wooster, Ohio.

A polyethylene tent protects softwood cuttings in a propagating box.

A propagating house with a mist system provides an ideal atmosphere in which to root cuttings.

Lead-covered electric cables provide bottom heat in a propagating bench, the degree of heat being thermostatically controlled.

CUTTINGS

By WALTER SINGER

Mr. Singer, who is Staff Photographer at The New York Botanical Garden, is experienced in propagating and growing plants. He started in horticulture as a boy in his father's nursery and practiced it in his own nursery in Florida, as well as in some of the largest greenhouse establishments both here and in Europe.

A CUTTING is a part of a plant which will produce roots and eventually a new plant quite true to the parent plant. Propagation from cuttings is called vegetative propagation, while propagation from seeds is called sexual propagation. Since propagating from seeds often produces great variation in plants, propagating from cuttings is preferred whenever it is possible to practice this method.

The success of vegetative propagation depends on the choice of plant material and on the conditions under which the cuttings are kept during the rooting process. Unrooted cuttings, especially softwood cuttings, are not able to absorb as much moisture as rooted cuttings or plants. Therefore, protection against drafts, intense sunlight, and other detrimental factors must be provided; otherwise these cuttings will wilt, dry out, and finally die.

A cutting may be a piece of stem, a leaf or part of a leaf, a piece of root or rootstock, or even a scale of a bulb. The part of the plant from which cuttings are taken depends on the growing habits of the plant. African violets, forming very low rosettes, do not produce

A small pot in the center of a propagating container is one of the best ways to water cuttings. The drainage hole is closed, but gradually the water seeps through the porous clay into the sand.

A glass jar over softwood cuttings creates a close atmosphere.

Cuttings can be rooted in water. To hold the cutting at the correct height and position, insert it in a hole which has been made in the center of a paper cup cover.

Hardwood cuttings are made during the dormant season, late fall or early winter. They should be stored horizontally, covered with six to eight inches of sharp, clean sand, in a protected coldframe or rooting cellar.

Eye cuttings are pieces of cane with one or two eyes (nodes) from which new plants are produced as illustrated here by *Philodendron panduraeforme* and *Monstera deliciosa*.

stems long enough for stem cuttings. Therefore, African violets are propagated from leaf cuttings. For this purpose, well-matured leaves are severed at the base from the parent or stock plant with a sharp knife or razor blade. The leaf-stems are inserted into clean, sharp sand only deep enough so that they can be anchored firmly and so that the leaf-blade will stand up vertically. If you could observe the rooting process at the bottom of the leaf-stem, you would notice that first a callus crown grows at this base, and a little later fine fibrous roots appear at that crown. After a good root system has been established, the cutting will produce a crowded complex of small leaf rosettes at the base, and they will eventually push through the sand. When these young leaves are large enough to be easily handled, it is time to pot up the new plants. You then divide or separate the young plants, potting each little rosette individually. One-crown African violets bloom more freely and produce larger flowers than complex rosettes.

This method of leaf propagation is also used for Christmas begonias, peperomias, echeverias, kalanchoës, gloxinias, sansevierias, and others.

There are exceptions, of course, to the rule of producing true species plants from leaf cuttings. A leaf cutting of a variegated peperomia, for instance, will produce a green plant without any variegation. The same goes for the golden-banded sansevieria. In such cases, it is necessary to add part of the stem in order to produce plants with the same leaf variegation. For the variegated peperomia, cut the stem between leaves and use the piece of stem with the attached leaf as a cutting.

The best cutting for a variegated sansevieria is a piece of the rootstock with the attached leaf, in order to obtain plants with the golden variegation in the leaf. This method is not necessary for the green varieties, since any part of a green leaf will produce a true green plant.

Some plants, such as rex begonias and gloxinias, re-

A cutting should be taken from the periphery of a plant where sun and air have made the shoots stronger than those in the center of the plant.

Two or three of the bottom leaves, also flowers and flower buds, are removed from cuttings of geraniums, fuchsias, and lantanas.

To initiate and shorten the rooting process, the bottom end of the cutting may be dipped in a hormone powder, such as "Rootone" or "Hormodin."

The cutting is inserted in the rooting medium (sand) which is firmed around it with the eraser end of a pencil.

quire only parts of a leaf for propagation. A leaf wedge is cut in such a way that the two sides of the wedge are bordered by leaf-veins or leaf-ribs which run together at the base of the cutting—in a somewhat V-shaped manner. The necessity for the piece of stem when making a cutting of the variegated peperomia and the variegated sansevieria, as well as the leaf wedge of rex begonia and gloxinia, is that the growing center (dormant eye or bud) is located there.

You may have observed a dormant eye or bud in the crevice where a leaf or leaf-stem is attached to the stem; this is obvious with a woody plant, such as a rose or lilac. Such an eye or bud is used for grafting or budding which, in a broader sense, is also making a cutting; in this case, only one-eye or bud-cutting is used for attaching to the understock. A hardwood scion is also a cutting—part of the stem being attached to the stem of another plant, the understock. These methods of grafting are employed for one reason or another, since the scion combined with the understock will make a better plant than a plant produced from a stem cutting on its own root system.

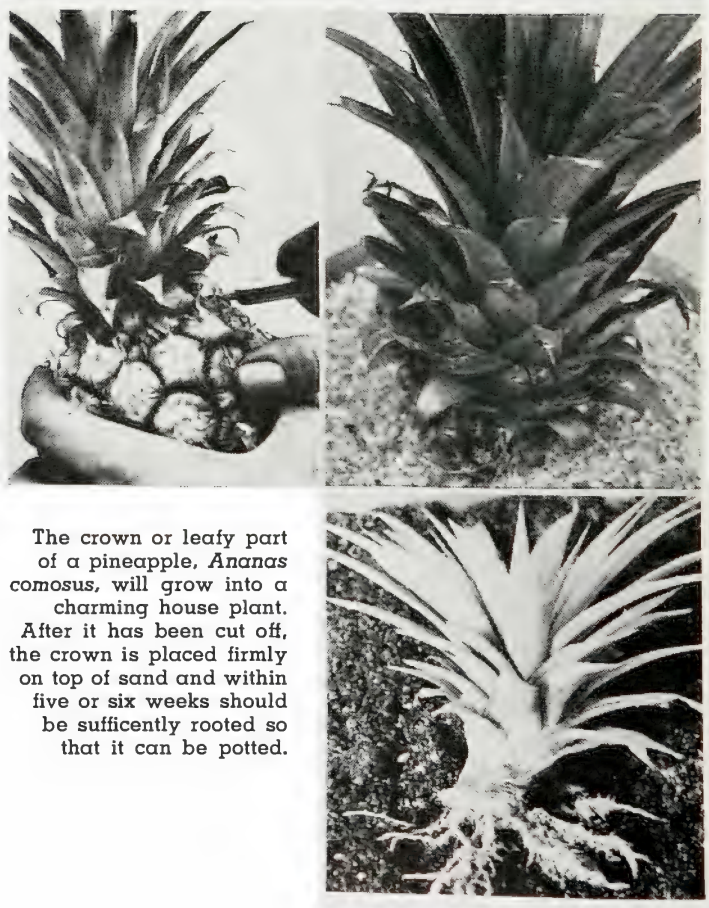
What part of the stem makes the best stem cutting? Here again, experience and experimentation are still the best means of solving the problems. First of all, there are two types of stem cuttings with regard to season and maturity or hardiness. These two groups are the softwood cuttings taken during the growing season and the hardwood cuttings taken from hard, dormant wood during the resting or dormant season. Among the plants from which softwood cuttings would be made are geraniums, coleus, fuchsias, begonias, philodendron—in fact, most of the house plants. Some shrubs, such as hydrangeas, deutzias, spiraeas, and also some roses can be propagated from softwood cuttings. Softwood cuttings need to have some degree of maturity. Usually four to five inches at the end of a shoot will make a good cutting, since the end of a shoot is grown on the periphery of a plant where ample light and air harden the shoot in contrast to those of the inner portion of a plant. A too soft cutting will rot quickly after it has been inserted in the propagating sand; the base of the cutting should be firm when held or slightly pressed between the index finger and the thumb. Use a sharp knife

Rooted cuttings are started in small pots—generally 2¼" is the best size—with good drainage and in a porous soil mixture.

or razor blade to make a cut squarely across the bottom of the stem, cutting slightly below a node.

Before you insert cuttings in the propagating sand, make a furrow with a wooden label or a blunt knife. When small amounts of cuttings are involved, make a hole with the tip of a pencil or a small dibble. These procedures help prevent the base of the cuttings being injured by the sharp sand.

In order to avoid air spaces, press the sand down firmly alongside the cutting without pressing against the soft stem. When using a pencil as a dibble, press down firmly with the eraser end. The greenhouse man floods the sand around the cuttings carefully in order

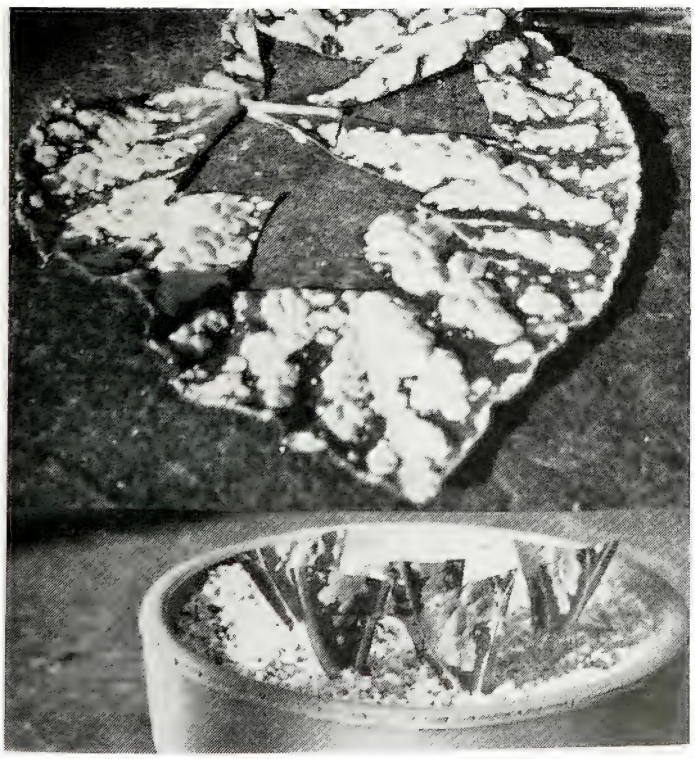


The crown or leafy part of a pineapple, *Ananas comosus*, will grow into a charming house plant. After it has been cut off, the crown is placed firmly on top of sand and within five or six weeks should be sufficently rooted so that it can be potted.

Pieces of canes of dieffenbachia, dracaena, cordyline, and similar plants are used in propagation. Placed horizontally in sand or vermiculite, the canes develop shoots; when the shoots produce three or four leaves, they are removed from the canes. Often these cuttings already will have developed roots at the base and can be potted up immediately.

to seal in the bases with the sand, but in the home such a method is not possible, nor is it possible to practice the mist system in the home. This relatively new aid for rooting cuttings has somewhat revolutionized the old concept of keeping cuttings enclosed in cases or tents or special propagating greenhouses. The mist itself provides the protection and keeps the cuttings in a humid and close atmosphere. In the home a terrarium, a glass tank or a glass bowl is the best container in which to root softwood cuttings—or a propagating box with a polyethylene tent over it is another good provision. Many softwood cuttings can easily be rooted with the base of the cutting suspended in water. However, a word of caution: roots developed in water are weak and brittle and are often damaged or broken off when the rooted cuttings are potted.

Rex begonias are propagated by cutting out wedges from mature leaves, and these are inserted in sand or vermiculite. The triangular wedges should be bordered by strong veins.



Stem cuttings do not have to be tip or terminal cuttings only. Sections of stems can also be used for stem cuttings. Philodendron, ivy, dracaena, or dieffenbachia stems, for instance, may be cut into sections and used as cuttings. If large amounts of cuttings are needed, a piece of stem as small as one single node or eye will produce a new plant. A good example of a one-eye cutting is that of the grape which is made from a one-node or one-eye piece of the hardwood stem.

Hardwood cuttings are usually sections of dormant hardwood collected in the fall after the plants have lost their leaves. Most of the flowering shrubs, such as viburnums, forsythias, spiraeas, hibiscus, and weigelias are propagated from hardwood cuttings. Hardwood cuttings should be at least six inches long but should not exceed twelve inches. They are cut at each end with a sharp knife or sharp pruning shears and covered with sand in a rooting cellar or coldframe until the following spring. To keep out severe frost, the coldframe is covered with salt hay or leaves and mattings. In the spring the cuttings are carefully dug up and planted in beds with only a small portion protruding above the ground.

Last but not least certain plants, such as sansevierias among the house plants and anemones and pachysandra of those grown outdoors, may be propagated by roots or rootstock. For this method, three to four-inch pieces of stout roots or rootstocks are cut and placed in sharp sand where they remain until new shoots have developed.

There are no firm rules for propagation by cuttings which apply to all plants except to select clean, healthy, and matured material. Success in propagation depends more upon the one who handles the cuttings than on the cuttings themselves, since the potentialities for producing a new plant are inherent in each cutting.

CALLED LILIES

By KITTY M. SIMPSON

Mrs. Simpson is Southern Field Editor of *Better Homes and Gardens,* an authority on old roses, and grows an interesting and varied collection of plants in her Shreveport, Louisiana, garden.

PERHAPS THE BEST-LOVED FLOWER next to the rose, down through the ages, has been the lily. This may be the reason why many flowers which are not true lilies have been called lilies, such as butterfly-lily, a member of the Ginger Family and botanically *Hedychium coronarium*. It is called butterfly-lily because the individual flowers appearing chastely white from the green, scaly bracts of the flower-head are shaped like a butterfly. Another sentimental name is "sweet snow." In Hawaii where it grows rampantly, *H. coronarium* is called lei flower and is used in making leis.

The rhizomatous roots, much like canna roots, may be planted eight or ten inches deep in rich, loamy soil, in spring or fall from Zone 8 southward. *H. coronarium* grows in half-shade to a height of five or six feet and is a fine poolside plant. It needs plenty of water during the growing season. Starting to bloom in late July, it continues until frost. When cut, a single stem will last over a week for the "butterflies" keep emerging from the conelike flower-head. They are sweetly perfumed, something like a mixture of the scents of gardenia and magnolia. I plant them beneath windows so that every little breeze will float fragrance into the house. Mine have taken down to 10°F. of cold when mulched, but in colder climes the roots should be dug and put into boxes of sand and placed where they will not freeze. Once you have known this lovely plant, you will never want to be without it.

Another member of the ginger family could be grown for its foliage alone—*Curcuma petiolata,* commonly called hidden-lily because the strangely exotic cones of flowers are hidden in the middle of the foliage. This plant has no trunk but the leaves, beautifully pleated, grow to three feet high. The twelve- to fourteen-inch high, conelike flower has rosy lavender bracts which hold the true small, yellow flowers. The cone has a bright tuft of bracts at the top. Some of the stunning arrangements seen in southern flower shows feature these leaves and flower-heads. The foliage, when cut, will last for two weeks as will the flowers. I have not tried drying the flowers, but I think they would dry well.

Butterfly-lily, *Hedychium coronarium.*

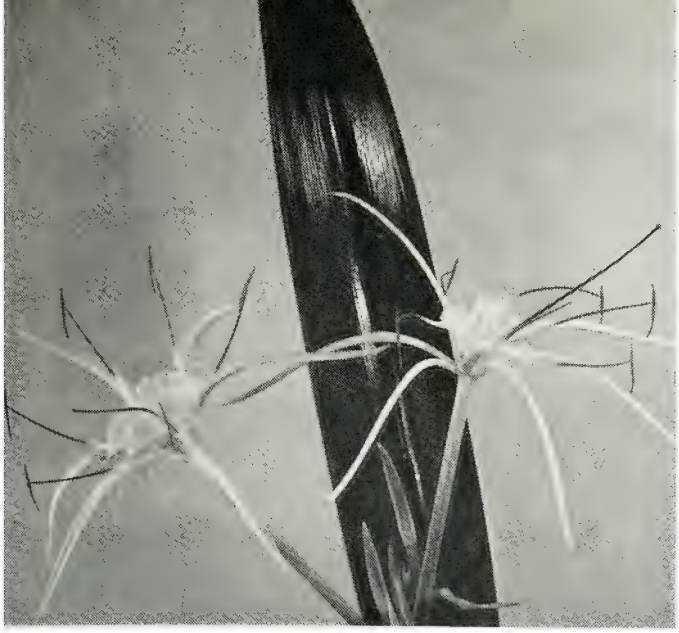
The variety *C. latifolia,* which comes to us from India, blooms before the foliage arises, but the blooms last for several weeks after that. Both these varieties grow in my garden without winter protection—the roots being planted about ten inches deep in good porous soil. Curcumas like a moist soil in the growing season and grow in half-shade. They bloom in July and August.

While *C. latifolia* grows to five feet, it could be grown in a large container and the container wintered where the roots would not freeze. In this case, the roots should not be allowed to dry out; water the container several times during the winter.

Few flowers have the lovely fragrance or delicacy of color as does the milk- and wine-lily, *Crinum erubescens*. The bell-shaped flowers are borne on tall stalks, milk-white with wine-pink markings on each petal; even the stamens are wine-colored. There are from eight to twelve blooms to a stalk; and if *C. erubescens* is cut as the first bud starts to open, all the flowers will open.

All the crinums are fine for the South, and I know of no bulb which responds more generously to food and water than they do. The bulbs should be planted in almost full sun and covered six inches deep. They in-

Milk- and wine-lily, *Crinum erubescens.*



Chalice-lily, *Hymenocallis expansa.*

Hidden-lily, *Curcuma petiolata.*

crease by offshoot bulbs, and an offshoot bulb will bloom in two years.

Chalice-lily, *Hymenocallis expansa,* also called basket-lily, grows to thirty-two inches high. The three-inch-wide, thick, strap-shaped leaves are satin shiny, much loved for line effect by flower arrangers. They last for two weeks when cut. The sweetly perfumed flowers, borne above the foliage, are white and exotic-looking. The stalks appear from midsummer until frost. In the lower South where there are not hard freezes, *H. expansa* is evergreen. Planted in good soil and below freeze-line, it will survive and give pleasure for many years.

Surprise-lily, *Lycoris squamigera,* also listed as Hall's amaryllis, naked lady, and magic-lily, always surprises and delights me when in late August it sends up the three-foot-high stalk of rose-lilac blooms which have a porcelain-like luster. Since it blooms without foliage—the foliage comes later and is straplike and evergreen—I plant this bulb in soil well fortified with bonemeal and in beds of English ivy. It is hardy as far north as New England. The surprise-lily comes from Japan and China where it grows wild.

Red spider-lily, *Lycoris radiata,* grows well all over the mid and lower South. I know a meadow where thousands bloom every fall with no care. The flower is a bright coral-red. I plant *L. radiata* in groups in beds of native ferns, for it also blooms without foliage; the evergreen foliage comes up as frost has killed the fern fronds. In the North the red spider-lily could be pot-grown and would be well worth the trouble.

Lycoris bloom best when left alone in colonies. The bulbs should be planted about two inches deep in sun or half-shade. When the bulbs need to be thinned, they have the habit of showing their necks above ground. This usually happens in about five years.

When I write that these flowers and foliage last well when cut, it is because I photograph under hot flood lights. And because I hardly know which end of the camera to point at the subject, it sometimes takes quite awhile to focus and set the camera. After which the only decent thing I can do is place the flowers in vases —you see I love flowers.

Surprise-lily, *Lycoris squamigera.*

Red spider-lily, *Lycoris radiata.*

THE VIBURNUMS

By ERIK A. NEUMANN

Mr. Neumann, who received an A.B. degree in botany from Indiana University, a M.S. degree in conservation from Purdue University, and was a special student in horticulture at Michigan State University, is now in charge of the Native Plant Garden at The New York Botanical Garden, under the direction of Louis Politi, Horticulturist.

THE GENUS *Viburnum* is perhaps one of the most diverse groups of ornamental shrubs. It is a member of the honeysuckle family, *Caprifoliaceae,* which also contains *Lonicera, Sambucus, Weigelia, Kolkwitzia, Symphoricarpos,* and *Abelia.*

The viburnums are deciduous or evergreen shrubs or small trees, a number of which are popular as ornamentals in American gardens. Many species are hardy and are valued for their attractive flowers, decorative foliage, and rich autumn colors; some for their colorful fruits and others for their evergreen foliage. They are good background plants for other ornamentals.

They are found in many parts of the world, primarily in the northern temperate zone. They are most abundant in eastern Asia—Korea, China, and Japan. A few species are native to western Asia. Viburnums occur in Europe and North Africa, and their range extends on the American continents from Alaska to the tropical regions of northern South America.

Further exploration in many of the more remote areas of the world should uncover additional species and clarify knowledge of the distribution patterns of the genus. Central America and eastern Asia seem to be the centers of diversity.

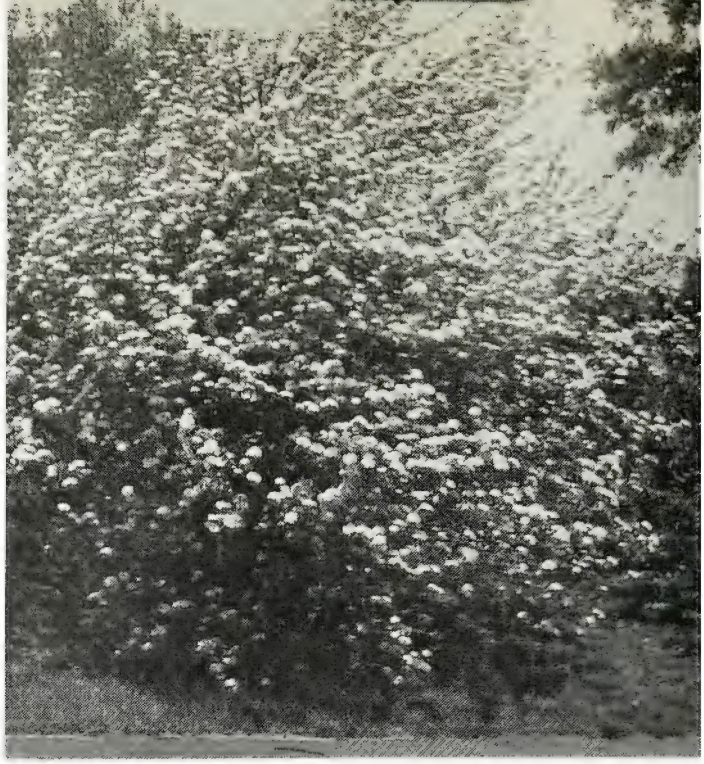
The majority of the species which are extensively cultivated are introductions from Asia. Only a few of the Central and South American species have been introduced. Species native to the United States have good growth habits and are attractive in flower, foliage, and fruit. They are dependable under cultivation and do well even under adverse growing conditions.

SPECIES WHICH ATTAIN THE SIZE OF SMALL TREES

Among the species of *Viburnum* which attain the size of small trees are *V. lentago, V. prunifolium,* and *V. rufidulum.*

Viburnum lentago, known as the sheep-berry or nannyberry and introduced into gardens about two hundred years ago, is considered by many to be one of the finest viburnums for autumn-coloring. It is found wild from Hudson Bay to Georgia on moist soil along stream banks and in light woodlands and will tolerate sunshine or shade. A handsome shrub or small tree, which may attain a height of up to thirty feet in nature, it generally remains somewhat smaller under cultivation.

The sheepberry has fragrant, creamy white flowers, measuring four to five inches across, which open in May and early June. The flower is similar to those of the wild carrot or Queen Anne's lace, being made up of hundreds of small, white flowers. The flowers are followed by attractive red fruits which later turn blue-black and remain on the shrub throughout the winter. This is a good shrub for shrub borders and thickets, useful in large, naturalistic plantings, but it is not as effective as a lawn specimen or for small home grounds.



Viburnum prunifolium.

Its fruit is eaten by birds and small mammals during summer, fall, and winter. It is also planted as cover for wildlife and provides browse for deer and rabbits. The fruit is edible and has been used for jellies.

The native black-haw, *Viburnum prunifolium,* is an excellent upright shrub or small tree which reaches fifteen feet at maturity. It bears a resemblance to the crabapple, and is worth growing for its brilliant fall foliage and its showy, dark blue fruits. Occurring naturally from Connecticut to Florida, this shrub will tolerate drier soil than the majority of the viburnums, and does best where it is exposed to sunshine. The black-haw is found commonly along roadsides and fences, and is planted to serve as a screen and as background for smaller shrubs. This species is slow growing and will live up to seventy-five years or longer.

Viburnum rufidulum is the southern counterpart of the black-haw and is native from Virginia to Florida. The southern black-haw attains a maximum height of thirty feet in the form of a large shrub or small tree. It is considered one of the best viburnums for autumn coloring and is well used in naturalistic settings. However, its use is somewhat limited because of its unpleasant odor.

This deciduous species has spreading, stiffish branches, lustrous foliage, and clusters of white flowers; it is characterized by a reddish fuzz on the winter buds, leaf stalks, and on the lower surfaces of the leaves. As the southern black-haw ages, its branches are often more spreading and open in their growth.

WIDELY KNOWN AMERICAN SPECIES

Viburnum trilobum (high-bush cranberry), *V. alnifolium* (hobblebush), *V. dentatum* (arrowwood), and *V. acerifolium* (dockmackie) are perhaps the best-known shrubby species.

Above. *Viburnum dentatum.*
Right. *Viburnum trilobum.*
Below. *Viburnum acerifolium.*

The high-bush cranberry or American cranberry-bush, *Viburnum trilobum,* is native from New Brunswick across North America to British Columbia and as far south as New Jersey, on hummocks in acid bogs, along streams, and wooded uplands. It likes rich, moist soil and will grow in deep shade or sunshine. The American cranberry-bush will survive severe winters and is immune to aphid distortion which attacks some of the other viburnums. It is a deciduous, broad-spreading shrub attaining a height of twelve feet. The dark green, maple-shaped leaves turn orange-yellow to reddish purple in the fall. Its creamy white flowers appear in May to June. The berries are attractive and usually remain on the shrub into the winter since they are not generally eaten by birds. They may be made into jellies since they are rich in pectin. Somewhat coarse in appearance, *V. trilobum* is well suited for planting in large places as a shrub border and as a screen, or as undergrowth in woodlands.

The hobblebush or American wayfaring tree *(Viburnum alnifolium)* of the eastern United States derived its name from people tripping over its low branches, which take root in the soil, as they walked in the woods. In its natural habitat (moist woods) the hobblebush reaches a height of ten feet. It is found native from New Brunswick to North Carolina to Michigan.

This viburnum is characterized by its broad, round leaves, from four to eight inches long—perhaps the largest of any of the viburnum leaves. The leaves are green, the underside covered with gray, felty hairs. The white flowers, borne in flat heads, are followed by red fruits which later turn black as they ripen. This species will not thrive in chalky soils so it cannot be grown in every location; it is, however, an appropriate species for moist sites.

The arrowwood viburnum, *V. dentatum,* receives its common name from the supposed use, by Indians, of its straight, narrow branches in making arrows. It is found in the wild from New Brunswick to Minnesota and Georgia, where it occurs on any soil, both upland or wet valley. It is a vigorous, upright shrub which attains a height of up to ten feet. This shrub does well in both full sunshine and deep shade, and is useful in a shrub border, screen, and in naturalistic plantings. This shrub possesses a noticable odor on rainy or humid days, when there is less air circulating and greater decomposition.

The arrow-wood viburnum *(V. dentatum),* and the downy arrow-wood viburnum, *(V. rafinesquianum),* are worthy of consideration for their attractive white flowers in June when few other shrubs are in bloom. While the arrow-wood viburnum tolerates shade and moisture, a drier situation on a bank approaches the native habitat of the downy arrow-wood viburnum. A naturalistic

Viburnum carlesii.

landscape is enhanced by the red-orange autumn foliage of both species. The fruits of the arrow-wood are a blue-black when ripe in the fall.

Resembling the arrow-wood viburnum is *V. molle,* which is of lower stature, possesses darker foliage, and flowers somewhat later.

The dockmackie, *V. acerifolium,* native from New Brunswick to North Carolina and Minnesota, attains a height of from five to six feet, is of upright form, has deciduous, maple-like leaves which turn an attractive rosy pink to wine-purple in the fall. Its fruit and flowers are not outstanding; its fruit is really more effective when still in its unripe red stage. The dockmackie is a shrub of somewhat dry, shaded hillsides and is useful in the wild flower garden or as undergrowth in woodlands.

Viburnums Cultivated in Regions With Mild Winters

The fragrant or Korean-spice viburnum, *V. carlesii,* is probably the favorite medium-sized viburnum in American gardens. *V. carlesii* was reportedly found in Korea in 1885, and is a maritime plant from Dagelet Island, Kanghwa Island, and several smaller islands of western Korea. Seed was obtained by a Japanese firm and later (around 1902) a plant was forewarded to Kew Gardens in England.

The Korean-spice viburnum usually does not exceed five feet in American gardens, but in its native habitat in Korea it may reach up to eight feet. This compact, deciduous shrub with broad-spreading branches prefers partial shade but will tolerate full sunshine. The blossoms, however, do not hold up well when exposed to sun. It is not adapted to damp, poorly drained soils. Especially noted for its fragrant, white, pink-tinged flowers in April and May, *V. carlesii* is particularly useful as a specimen or in a shrub border.

V. carlcephalum is a hybrid between *V. carlesii* and *V. macrocephalum.* Although it is not as fragrant as *V. carlesii,* its flower clusters are larger, being up to five to six inches in diameter. The habit of growth closely resembles that of *V. carlesii,* as does its foliage which is attractive in the autumn. It reaches a height up to six

Viburnum dilatatum.

feet and possesses strong, erect branches.

This hybrid, which originated in England, was introduced about 1952 in the United States. It does well in rich loam, in either acid or slightly alkaline soil. It is useful as a specimen plant in partial shade. There seems to be some question among horticulturists whether the popularity of this hybrid is justified, since the flower clusters are often so sparse that they do not form an effective display.

Viburnum burkwoodii is a semi-evergreen hybrid between *V. carlesii* and an evergreen species, *V. utile.* Its foliage is considered to be superior to that of *V. carlesii,* although its leaves persist into late fall without autumn color. The glossy, dark green foliage is inherited from the evergreen *V. utile* and in temperate climates it will often be evergreen.

This species is similar in height to *V. carlesii* but must be pruned, after flowering, in order to avoid an open, loose form. The flower is fragrant, but its scent differs from that of its parent. Although it is supposed to be an improvement over *V. carlesii,* it is not so hardy. It requires a well-drained, loamy soil and partial or deep shade for best growth. This shrub may be planted as a specimen or used in a shrub border. It will do well under city conditions.

The linden viburnum, *V. dilatatum,* is a deciduous, upright, spreading shrub native to eastern Asia where it may grow twelve feet tall. It has recently become widely planted, being excellent as a screen or in a shrub border, where it should be grouped for best effect. However, because of the unpleasant odor of the showy white flowers, which cover the bush in May and early June, the linden viburnum is not recommended for planting close to a house. Its bright red fruit is persistent and remains on the shrub throughout the winter, since birds do not usually eat it.

A yellow-berrying variety is available, *V. dilatatum* var. *xanthocarpum,* which is also considered to be a

good fruiting shrub, its berries persisting after the leaves have fallen.

One of the viburnums native to Japan and China, *V. tomentosum,* is a dense, six- to ten-foot-high shrub. It is distinctive in appearance, because its branches extend out almost horizontally. Its leaves are dark green, smooth on the upper surface, somewhat hairy on the under surface, and prominently veined. The flat, creamy white cymes of fertile and sterile flowers, the latter being the marginal ones, are showy; and its fruit, first red, then turning blue-black, is attractive. *Viburnam tomentosum* will grow in light shade as well as in sun, preferably in a moist soil. It was introduced to cultivation one hundred years ago.

Evergreen Viburnums

Laurestinus, *Viburnum tinus,* is one of the best-known of the evergreen viburnums. Native to the Mediterranean region, it is extensively grown in Europe and many temperate areas of the world, though it does not do well in this country north of Washington, D.C.

It will grow in moderate shade, but will flower more freely when exposed to the sun at least part of the day. Care must be taken that the leaves do not become scorched in full sunlight. Although *V. tinus* flowers more sparsely in shade, it is protected there from occaisonal frosts which may damage the foliage and destroy some of the flower buds.

This compact, well-branched shrub reaches a height of six to twelve feet. It bears waxy, white flowers which begin opening in the fall and continue, in a mild climate, through the winter and into early spring when it puts on its best show. Berries and flowers may appear on the shrub at the same time, the berries turning from a blue to black.

This shrub is most effective when planted in mass, as a screen, or hedge. Since it is a very slow grower, spacing the plants about three feet apart will encourage somewhat quicker growth.

Several varieties are attractive and widely planted—

Viburnum rhytidophyllum.

Viburnum tomentosum and, at right, close-up of long-stalked cymes of its creamy white flowers.

among them: *V. tinus purpureum,* with purple-tinged leaves; *V. tinus variegatum,* with variegated foliage; *V. lucidum,* with large, glossy green leaves and larger flowers; and *V. tinus* var. 'French White' with large, lacey, white flowers.

The laurestinus is a good shrub for growing in cool greenhouses, pots, or tubs.

The sweet viburnum, *V. odoratissimum,* is a native of Japan, China, and India, where, depending on en-

(Continued on page 239)

Viburnum tinus.

Right. On the patio of an apartment house in Forest Hills, Long Island, container-grown plants furnish a succession of blooms. The windowsill planters, on the ground against the red brick building, contain seedling oleanders and poincianas.

Left. Behind the fence on the opposite side of the patio, and fifteen feet below, are the tracks of the Long Island Railroad.

GARDENING IN CONTAINERS

GARDENING HAS BEEN the hobby of Oscar L. Weiss since boyhood. Perhaps he inherited his enthusiasm for plants from his uncle who was an orchardist in central Europe—he did some unusual grafting of fruit trees, growing several kinds of fruits on one tree.

Mr. Weiss has gardened in widely separated areas—in San Francisco, California; in a little town near Basle, Switzerland, where he helped friends develop their garden; and more recently in Chicago, Illinois, and Forest Hills, Long Island. Living in an apartment in these last two cities, his gardening, however, has been more confined—to growing plants in fiberglass containers.

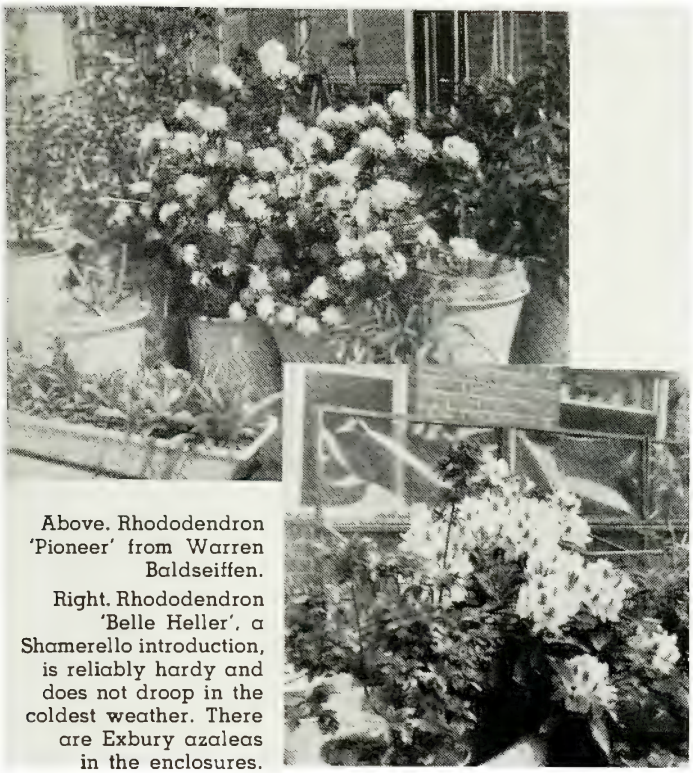
In the past six years at Forest Hills, he has successfully grown quite a variety of annual, bulbous, and perennial plants, and some shrubs. Among the annuals are abronia or sand-verbena, *Cheiranthus cheiri* or wallflower, which is a perennial but usually treated as an annual here, *Dianthus chinensis* var. *heddewigii, Phacelia (Eutoca) viscida,* platycodon, talinum, and also wahlenbergia.

Tulips and other spring bulbs flourish in containers; and rose 'Tropicana' is in bloom, June, 1965.

Because of space limitation, Mr. Weiss grows only those irises that have won the Dykes Medal, including this year's winner and "runner-up," 'Rippling Waters' and 'Orange Parade'. Here are 'Whole Cloth' and 'Truly Yours'. The lath-house in the background accommodates African violets, begonias, fuchsias, and other house plants during the summer.

Dahlia 'Carrie McAvoy', one of the container-grown dahlias. Other dahlias responding well to this treatment are 'Carlotta', 'Celebrity', 'Coppertone', 'Goldie', 'Kenya', and 'Prospector'.

This healthy columbine was raised from seed which was brought from Japan and sown in spring 1965. It flowered freely in June, 1966.



Above. Rhododendron 'Pioneer' from Warren Baldseiffen.

Right. Rhododendron 'Belle Heller', a Shamerello introduction, is reliably hardy and does not droop in the coldest weather. There are Exbury azaleas in the enclosures.

Not only does Mr. Weiss raise annuals from seeds but a number of other plants, including oleanders from his cousin's garden in Tel Aviv and poincianas. The seeds of the latter, which came from a locality near the Sea of Gallilee in Israel, were soaked in boiling water before being sown to hasten germination. The seedling plants, now four years old, are two and a half feet high.

Mr. Weiss enjoys a succession of colorful blooms from spring till fall on his south-facing patio, and during the rest of the year African violets, begonias, fuchsias, and other house plants brighten his apartment. He believes that others can—and should do likewise.

VIBURNUMS (Continued from page 237)

vironment, it will grow from ten to twenty-five feet tall. This species is not reliably winter hardy in northern areas—the wood of the current season's growth may be damaged by frost.

Its fragrant, pure white flowers open in late May. The leathery, bright green leaves measure up to eight inches long and four inches wide. Its fruits are red and later turn black. It is for its evergreen foliage that this shrub is treasured; and it should be planted in a sheltered spot.

The Japanese viburnum, *V. japonicum,* introduced from Japan, is an upright shrub reaching a height of six feet. It is one of the hardiest evergreen species. The leaves are thick and glossy. The white flowers, which open in summer, are borne in clusters four inches across and are later replaced by red berries. This species is suited to sun or partial shade but thrives best in woodland.

The leatherleaf viburnum, *V. rhytidophyllum,* native to central and western China, was introduced for cultivation in gardens in 1900. It attains a height of ten feet; has strap-shaped, almost evergreen leaves up to

Hardy water-lilies thrive in the small pool on this Forest Hills, Long Island, patio.

eight inches long; cream-white flowers which appear from April to June; and fruits which are red and later turn to black. This shrub should be planted in good soil in a sheltered location away from strong wind and drought. In its native habitat in China, *V. rhytidophyllum,* is reported to grow in colonies and reach up to twenty feet high.

Sandankwa viburnum, *V. suspensum,* is a handsome evergreen grown extensively in southern gardens, and in cool greenhouses or indoors in tubs in more northern locations. This shrub is native to the Liu-kiu Islands of southern Japan. It attains a height of four to six feet and in early spring bears small clusters of pinkish cream-colored flowers, which are later replaced by red fruits.

RHODODENDRON POISONING (Continued from page 217)

decided in early January to stop the medication. The patient lived for nine months afterward, his arthritis somewhat improved.

Fourteen other suffering rheumatics were given the rhododendron infusion with similar hideous results described in lurid, conscientious detail by the German doctor. Two of them died, but the physician thought that the tea was not responsible. Dr. Koelpin felt that the treatment in his eleventh case was particularly successful in relieving the pain of arthritis and so he published, in 1779, his treatiste for the guidance of the medical profession, *Praktische Bemerkungen uber den Gebrauch der Sibirischen Schneerose* (The Use of the Siberian Snow Rose in Arthritis). He recorded his observations and reassured other doctors that, rumors to the contrary, they need not fear that their patient's mental condition would be affected by the snow-rose [*R. chrysanthemum*] tea. He also warned against impatience with weak, old, or long-confined patients who took much longer to respond favorably, and commented that sometimes temperamental persons were not improved at all.

(To be continued)

CONVERSATIONS ON ECOLOGY XVII

Dr. Richard Goodwin, of Connecticut College (New London) is the President of The Nature Conservancy. He has done a great deal to bring that organization to its present high level of influence. As a botanist who has done research in cytogenetics, physiology, and ecology, and as a teacher and administrator, he brings a most valuable experience to the field of conservation.

THE NATURE CONSERVANCY

New London, Connecticut
June 30, 1966

Dear Pierre:

From the window of a transcontinental jet one can assess the tremendous impact of man upon the land. Smoking cities sprawl across the valleys and creep up the hillsides. Raw scars mark further encroachment into the green mantle. Marshes are ditched, estuaries filled with boats. The great plains are laid out section by section into neat squares. Valleys are drowned, mountainsides laced by logging roads, and even the desert is cut by fence lines demarking areas subjected to differing land use. Where can one still hope to find primeval America?

When we think of the urgent problem of preserving representative fragments of our rich natural heritage across the nation, we think of The Nature Conservancy, for this is one of the agencies which is attempting to do the job. Indeed, it is the only privately supported national membership organization the primary objective of which is to establish and protect natural areas.

Although ecologists had been concerned about the accelerating destruction of natural conditions for many years, it was not until 1945 that they established the Ecologists' Union to develop an action program for the preservation of habitat. The name of the organization was changed five years later to The Nature Conservancy.

From the outset the Conservancy has directed its efforts toward the acquisition and permanent protection of natural areas for use as scientific and educational facilities and, incidentally, places where people can find spiritual refreshment. Increasing emphasis is being placed on this latter value of the program with the growing awareness of the impact of the population explosion.

The objectives of preserving natural areas are many, and sweeping generalities about a program are dangerous, because valid exceptions can always be found. However, the maintenance of natural biological communities of all types, with minimal interference from the hand of man, is most frequently the guiding principle. And, with the drastic modifications wrought on the face of the land by our civilization, even the maintenance of "natural" conditions may require some carefully planned management procedures. Just one example will suffice to make my point. The midwestern prairie community has, through millennia, been subjected to periodic fires and the pressures of grazing by buffalo, antelope, and other species of animals which, in turn, have been in balance with their predators. These influences are no longer present on a quarter section separated from the surrounding farmland by roads and fences. The maintenance of such a community requires some thoughtful manipulation.

Since it took title to its first preserve twelve years ago, The Nature Conservancy has acquired by deed or contract almost fifty thousand acres of choice habitat—some of it nearly in its pristine state and some of it, as in the case of the Mianus River Gorge Preserve in Westchester County, New York, and the Mentor Marsh in eastern Ohio, very close to urban centers. These acres represent 149 separate preserves scattered across thirty-two states. Twenty-six of these have been turned over to other responsible organizations and agencies with binding legal restrictions, while the remainder are being managed by the Conservancy.

In addition to the preserves already mentioned, many more, acquired and owned by other organizations, have been aided in one way or another by The Nature Conservancy. Thus, the Conservancy has become substantially involved in preserving at least thirty-three other areas totaling some twenty-two thousand acres. The present value of all this real estate can be measured in millions of dollars.

How has the Conservancy been able to accomplish so much in so short a time? The answer lies partly in the dedicated work of its members, who now number close to ten thousand, partly in the generous financial support of a few large donors which has enabled the Conservancy to finance its operations, and partly in the imaginative way in which the organization has met challenging opportunities.

Some of the Conservancy's natural areas have been acquired by gift. Examples are the 555-acre Woodbourne Forest and Wildlife Sanctuary, containing an old-growth hemlock and hardwood forest in eastern Pennsylvania, and the forty-acre Blanche Hamilton Wildlife Sanctuary, which protects a rare desert waterhole near the Angeles National Forest in southern California. Since gifts of real estate can be used as charitable deductions on the federal income tax return at currently appraised values, they may become particularly attractive to those in high income tax brackets, who may wish permanently to preserve natural conditions on their land. Such gifts permit landowners to avoid property taxes and confiscatory inheritance taxes on their estates. In many states the Conservancy is holding land free of tax obligations because of its scientific and educational objectives.

Many preserves have been acquired by purchase. These represent choice bits of habitat which have been selected by project committees or Conservancy Chapters as being especially worthy of preservation. Examples of such projects are: the Beckley Bog in Norfolk, Connecticut, where the impact of beaver upon the

vegetation is being studied under a research grant sponsored by the National Science Foundation; Dysart Woods, a virgin hardwoods forest in eastern Ohio; the Battle Creek Cypress Swamp, the most northerly stand of the bald cypress on the western shore of Chesapeake Bay; the Chiwaukee Prairie, the last remaining sample of original prairie along the shores of Lake Michigan in Wisconsin; Rookery Bay, a complex of Mangrove-girt islands, shoals, and inlets on the southwest coast of Florida, teeming with spectacular species of birds and other wildlife; the Patagonia-Sonoita Creek Sanctuary, a mile of permanent stream flowing through the desert south of Tucson, Arizona, famous for its abundance of rare birds; and the Sand Ridge Wildflower Preserve, one of the last remaining stands of wild flowers in Kern County, California. The volunteer services of the Conservancy's scientific members have been of the utmost value in finding, evaluating, and giving priority rating to these scientifically significant natural areas.

Fund drives ranging from five thousand to several hundred thousand dollars have been successfully completed. But frequently funds have been required to purchase options or meet payment schedules before the project committee has had an opportunity to launch the fund-raising campaign. In such cases the Conservancy's revolving loan fund, now totaling about $750,000, has been instrumental in aiding the preservation effort.

More recently the Conservancy has played an important role in aiding state and federal agencies with their land acquisition programs. The first case was the purchase of Rips Retreat, an inholding on a lake in the New York State Forest Preserve. The State, being unable to bid at public auction, asked the Conservancy to do so. Thus the property was acquired and subsequently sold to the State at cost.

In northern Idaho a large inholding within the Upper Priest Lake Primitive Area was about to be developed by the owner. The United States Forest Service, unable to act without special legislative action, asked The Nature Conservancy to purchase and hold the property until an appropriation could be obtained. The Conservancy held this land with a $30,000 mortgage until $500,000 was appropriated by Congress specifically for its purchase.

In a third instance a beautiful 9,750-acre forest in the coastal ranges of Santa Cruz County was acquired by the Conservancy from the Marks family for conveyance to the State of California as a State park. There was considerable urgency for prompt action because of the ages of the donors, and the Conservancy arranged the financing of a large loan to liquidate a mortgage on the property until the State could obtain the necessary funds. Thus the State was able to acquire a park worth several million dollars, for a cost to the public of $500,000, through the generosity of the Marks family. The Conservancy now holds a reverter interest and so can act as a watchdog to assure certain wilderness provisions applicable to the central portion of the area.

Numerous additional examples might be described. The private agency can play an important and much-needed role in aiding the government to acquire lands for park and other open space purposes. The Conservancy anticipates filling this function at a stepped-up level in the months ahead, and it hopes to obtain substantial additions to its financial resources to enable it to do this.

There are other ways in which the Conservancy promotes the preservation of natural areas. The organization has been developing special knowledge and techniques for carrying out its objectives and is prepared to help individuals and other organizations by sharing this know-how. Especially important have been some of the legal devices which have been designed to assure continuity of land use. These include charitable trusts, conservation easements, and mutual covenants.

The covenant is an especially interesting approach to the preservation of open space. A group of owners of contiguous land signs a document which pledges each one to refrain from doing certain things which would impair the natural values on his land. This agreement runs with the land so it is binding upon subsequent owners. When a conservation agency is one of the owners, this kind of arrangement can become a very permanent one. The banks of the Bantam River in Litchfield, Connecticut, are being preserved by this kind of covenant in which the Conservancy is a participating landowner.

Looking toward the future, the Nature Conservancy will be playing an increasingly important role as a custodian of the natural areas in its own ownership and as a watchdog over others. Numerous preserves have been given to institutions which have accepted them with binding legal restrictions or with strong moral obligations. An alert national organization can do much to keep the memory of these restrictions as green as the precious vegetation, the base of the food chain they were established to protect.

Right now the land-use pattern within our country is being relentlessly and irrevocably set, and what we accomplish in the next ten years will be of critical importance to our program. In contrast to the situation in Great Britain, at least we still have some of the original natural communities to preserve. The support of The Nature Conservancy deserves the thoughtful consideration of every citizen, and especially of every biologist for whom the existence of a diversity of living organisms is the basic scientific resource.

Cordially yours,
RICHARD H. GOODWIN
President

The world is too much with us: late and soon,
Getting and spending, we lay waste our powers:
Little we see in Nature that is ours;
We have given our hearts away, a sordid boon!
The sea that bares her bosom to the moon;
The winds that will be howling at all hours,
And are up-gathered now like sleeping flowers;
For this, for everything, we are out of tune;
It moves us not.

WILLIAM WORDSWORTH

CONVERSATIONS ON ECOLOGY XVIII

Dr. Pierre Dansereau is Senior Curator and Head of the Department of Ecology of The New York Botanical Garden.

Percé, Quebec
August 31, 1966

Dr. Richard Goodwin
Connecticut College
New London, Connecticut

Dear Dick:

The New York Times of August 27 reached me this morning with the news of Dr. Charles H. W. Foster's appointment to succeed you as president of The Nature Conservancy. I think we can expect new and valourous initiatives from a man who brings such excellent qualifications to his job. But what I do know is how deeply indebted we are to you for bringing the Conservancy to its present high level of operation and influence.

The achievements which you outline in your letter of June 30 are certainly impressive, and it is well that they should be widely recognized as part of an overall plan to preserve the full gamut of the natural environments of North America. A symposium organized by the Conservation Foundation at Airlie House, Virginia, last year, concerned itself with this topic. As you will see when you read the papers presented on that occasion,[1] we do not seem to have a full repertory of "habitats," even less of communities. Harshberger[2] was much concerned with floristics, and Shantz and Zon[3] gave us a small-scale map of the "vegetation zones" of the United States; otherwise we have very few broad regional monographs. Lucy Braun's book[4] on eastern North America and Jensen's paper[5] on California are two of the best examples: I am almost tempted to list all such monographs herewith: I could not fill many pages! Two recent summaries on the vegetation of the United States (Küchler[6] and Knapp[7]) give us ample proof that the very inventory upon which a comprehensive national policy can be based is lacking.

In other words, we need to know what lies inside each one of the areas defined by Shantz and Zon and by Küchler a great deal more than we need to discuss their justification for drawing boundaries where they have. Thus: what percentage of the United States territory is now covered by vegetation maps at the scale of 1:200,000? And how about 1:50,000 or 1:25,000? If we compare our situation with that of several other countries (U.S.S.R., France, Germany, New Zealand) we are forced to conclude that vegetation science (and especially mapping) captured the attention of very few American ecologists in the period 1920-1960, when it was flourishing elsewhere.

And now, it would seem that ecology has moved to higher and more significant tasks, beyond the merely "descriptive." So we find ourselves, in 1966, faced with certain tasks for which a dwindling number of workers are equipped. Senator Gaylord Nelson has presented a bill[8] for an ecological survey of the U.S.A., and the International Biological Programme will concentrate much of its attention on productivity of plant-communities.

Both of these undertakings require our best attention, I am sure. But neither of them can be carried on without high-level control. If Senator Nelson's bill is approved by Congress, I greatly fear that its implementation will be fragmented in such a way that the Department of the Interior (and singularly the National Park Service) will not be in a position to direct and manage it.

You may remember from previous conversations that I do not wholeheartedly accept the prevalent American confidence in the superiority of private enterprise over government action. This is no place and time to discuss the political theory that is basic to such preferences. If we stick, however, to conservation issues we can offer ourselves the grand spectacle of an acute crisis of authority where pollution of rivers and air, development of power (hydroelectric and atomic), and recreation run head-in to the present and future interests of science—and therefore of tomorrow's society. Will the famous "checks and balances" fail us this time?

Maybe I should not be shocked by several statements in your letter which point to the supplementary power of The Nature Conservancy at times and places when a public agency was unable to take action because of restrictive legislation. Other letters in the present series (Dagon, Lindsey, Boyle) point out some of these conflicts. But no one is inclined to suggest changes in the legislation itself!

I am afraid I am all-questions-and-no-answers! And maybe this is why I am happy to appeal to those, like you and Lindsey, who may have a better line on the coupling of scientific truths with political realities. Obviously, you both are the kind of professional ecologist that can best converse with people like Boyle.

So let us keep the conversations going–

Yours,
Pierre Dansereau

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1. "The future environments of North America," edited by F. Fraser Darling and John Milton, to be published by Doubleday in late 1966.
2. John W. Harshberger: Phytogeographic survey of North America. 1911. Reprint edition, 1958, Hafner Publ. Co., New York, xii + 790 pp.
3. Homer L. Shantz, and Raphael Zon: Atlas of American Agriculture. 1924. U. S. Dep. Agr., Washington, D. C.
4. E. Lucy Braun: Deciduous forests of eastern North America. 1950. The Blakiston Co., Philadelphia, xiv + 596 pp.
5. H. A. Jensen: A system for classifying vegetation in California. 1947. Calif. Fish & Game, 33(2):199-266.
6. A. W. Küchler: Potential natural vegetation of the conterminous United States. 1964. Amer. Geogr. Soc. Spec. Publ. No. 36, 39 pp. + 116 plates.
7. Rüdiger Knapp: Die Vegetation von Nord- und Mittelamerika und der Hawaii-Inseln. 1965. Gustav Fischer Verlag, Stuttgart, Germany, xl + 373 pp.
8. Senator Gaylord Nelson. The ecological research and surveys bill. 1965. 89th Congress, S. 2282, July 13, 1965.

XVII INTERNATIONAL HORTICULTURAL CONGRESS

By DOROTHY EBEL HANSELL

EXCITING, STIMULATING, EXHAUSTING, FRUSTRATING. Exciting and stimulating to meet and talk with professional and amateur horticulturists from foreign countries as well as from all parts of the United States, and to listen to provocative papers and discussions. Exhausing to walk considerable distances, in excessively high humidity and high temperature, from building to building on the thirty-three-hundred-acre campus of the University of Maryland at College Park. (This was particularly trying on the foreign delegates unaccustomed to such "sticky weather.") Frustrating to hasten to a session in which one was especially interested to find not even standing space in the room—and the adjacent corridor also crowded!

But it can be reported that the several thousand attendants to the International Horticultural Congress and the meetings of the American Institute of Biological Sciences, held jointly during the week of August 14-20, 1966, took the discomforts and annoyances with more or less good grace, fully aware of the problems involved in accommodating so many people, fully appreciative of the painstaking efforts of the A.I.B.S. and Congress Committees. Their interest in the sessions and their enjoyment of the special events and the opportunity of renewing old friendships and making new ones was evident as the delegates clasped hands and joined in singing "Auld Lang Syne" at the end of the International Horticultural Congress banquet on Friday evening. The singing of this universal favorite (it was sung at the conclusion of the International Congress in Brussels, Belgium, four years ago) followed the announcement by Dr. P. Spiegel-Roy that the XVIII International Horticultural Congress will be held in Israel in 1970, his cordial invitation to all to attend, and his להתראות (Fare thee well) and אלהים יהיה בעזרכם עד שניפגש שנית. (God be with you till we meet again).

As one Congress attendant expressed his opinion—"This is the way such a banquet should be. Pleasant companions at the table, a toastmaster who has the situation well in hand, an excellent guest speaker." The toastmaster was Dr. George H. M. Lawrence, Director of the Hunt Botanical Library of Pittsburgh, Pennsylvania; the speaker was Dr. H. R. Fletcher, Regius Keeper, Royal Botanic Garden, Edinburgh, Scotland. Dr. Fletcher's wit in his introductory remarks and his superb delivery captivated his listeners and readied them for his serious, thought-provoking address on "Horticulture—Challenge and Opportunity." (The address, it is understood, will be published in its entirety by the International Horticultural Society.)

Immediately after the formal opening of the XVII International Horticultural Congress by the President, Dr. H. B. Tukey, Sr., the plenary session convened jointly with the American Institute of Biological Sciences—"Human Population Growth and the Quality of Life" being presented by Dr. Clement L. Markert, President of the American Institute of Biological Sciences, and "Population Growth and the Future of our Natural Resources" by Dr. Harrison Brown, Foreign Secretary of the National Academy of Sciences. At subsequent plenary sessions, Dr. S. J. Wellensiek of the Agricultural University of The Netherlands, Wagenengin, gave a discourse on "Flowering"; Dr. P. H. Kutschenreuter, Director of the Environmental Science Services Administration of Washington, D. C., on "Science and the Weather"; and Dr. Stanley Cain, Assistant Secretary of the Department of the United States Interior, on "Man and His Environment."

Since the Garden Writers Association of America held early breakfast-meetings on Tuesday, Thursday, and Friday, preceded by directors' meetings; and on Wednesday morning the American Association of Botanical Gardens and Arboretums a breakfast preceded by a directors' meeting and followed by a tour of the United States National Arboretum and annual meeting there, I attended only the first plenary session in full, the others in part.

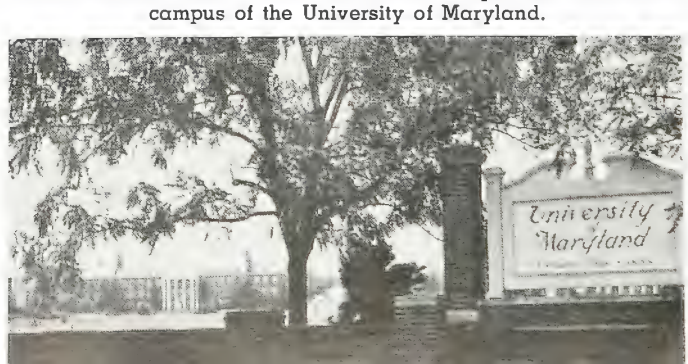
The Garden Writers enjoyed a guest of honor at each of their breakfast-meetings—Prof. H. Brian Rycroft, Director of the National Botanic Gardens at Kirstenbosch, Cape Province, South Africa; Patrick M. Synge, Editor of the Royal Horticultural Society of London, England; and Leslie Laking, Director of the Royal Botanic Gardens at Hamilton, Ontario, Canada. Prof. Rycroft entertained the Garden Writers with several delightful anecdotes; Mr. Synge explained the Royal Horticultural Society's new color chart; and Mr. Laking talked about the Royal Botanic Gardens, extending a cordial invitation to visit there.

I attended the all-day session on Tuesday of the International Association of Botanic Gardens of which Dr. Fletcher was Chairman. It was one of the most stimulating sessions of the Congress.

Dr. Fletcher presented the proposal of an international directory of living plant material, which developed from the meeting of the International Association

Left. Cole Student Activities Building in which the XVII International Horticultural Congress was opened and the first plenary session held jointly with American Institute of Biological Sciences.

Below. Another area of the extensive thirty-three-hundred-acre campus of the University of Maryland.



of Botanic Gardens, held at the International Botanical Congress in Edinburgh in 1964, and especially from the resolution of the meeting which was passed by the Congress at its plenary session. The resolution reads:

"The Tenth International Botanical Congress, recognizing the increasing role of botanic gardens and arboreta in supplying materials and information for research in all botanical disciplines, recommends the expansion of such activities and the development of documented collections of authenticated taxa in botanic gardens throughout the world."

A paper and questionnaire were circulated to all botanic gardens and arboreta in the *International Directory of Botanic Gardens* and to seventy-eight others; in all, some six hundred. Less than a third responded. Dr. Fletcher briefly reported on the state of affairs pertaining to many so-called botanic gardens and arboreta, indicating that they would be "useless from the point of view of this particular exercise." He added that it was "only fair to state that the form of the questionnaire on 'Living Collections of Documented and Authentically Named Plant Material' was not suitable for summarizing the important collections of this nature at certain botanic gardens and arboreta, of which the Arnold Arboretum is a good example." In the ensuing discussion, representatives of botanic gardens and arboreta expressed the opinion that an international directory of living plants should not be limited to species but should include cultivars.

At the request of Dr. Fletcher, Henry Norweb, Director of the Holden Arboretum, analyzed the answers to the "Questionnaire on Plant Records" distributed in preparation for the April, 1966, issue of the American Association of Botanic Gardens and Arboretums *Newsletter*, which was devoted to the topic of plant records. This elicited questions and comments from those associated with botanic gardens and arboreta in foreign countries as well as in the United States. Another presentation, that of "The Application of Electronic Data Processing Methods to Botanical Garden and Arboretum Records," by Robert D. MacDonald, Director of the University of Tennessee Arboretum at Oak Ridge (see page 246 of this number of *The Garden Journal*), also aroused considerable interest and discussion. In concluding his paper, Dr. MacDonald suggested "The formation of a committee to look into the feasibility of initiating an International Plant Records Compilation Center."

At the annual meeting of the American Association of Botanical Gardens and Arboretums, held the next morning, the Association voted to sponsor a pilot test at The University of Tennessee Computing Center. For this pilot test, Lee W. Lenz will provide the inventory of plants at the Rancho Santa Ana Botanic Garden at Claremont, California, and P. C. Hutchison will furnish the plant records of the botanic garden at the University of California at Berkeley. Ten botanic gardens and arboreta will support the test by contributing $300 each —those immediately volunteering to do so were Mr. Norweb for the Holden Arboretum, Dr. Richard A. Howard for the Arnold Arboretum, and Dr. Lenz for the Rancho Santa Ana Botanic Garden.

I attended the colloquium on "Nomenclature and Registration of Cultivars," at which Dr. Fletcher and Dr. Howard brought up some of the problems being considered by the International Commission and referred to specific areas, either unclear or inadequate, which the Commission will endeavor to iron out. A paper on "The Stabilization of the Latin Names of Horticultural and other Economic Plants" was presented at the afternoon session by John S. L. Gilmour, Director of the University Botanic Garden at Cambridge, England. It created considerable comment, pro and con. Mr. Gilmour stated, "The view has been growing rapidly in recent years that it is not a practicable policy for the users of names of horticultural and other economic plants to follow the numerous changes proposed by taxonomists and that some other policy will have to be devised." He suggested "the most sensible solution would be for a suitable international body to sponsor or, at least, to coordinate lists of *recommended names* for use by horticulturists and others concerned with economic plants for, say, the next ten years . . . Most of the recommended names would be those generally ac-

The entrance to the Administration Building of the United States National Arboretum with its attractive planting of chrysanthemums and evergreens.

cepted by botanists, but others widely used by horticulturists—and to promote stability—would be different from those used by all, most, or some botanists; such names might be called horticultural, agricultural, or forestry equivalents, as the case may be." Mr. Gilmour cited examples and also noted that "the International Commission for orchid taxonomy, nomenclature, and registration is already compiling a list of *recommended names* for orchids."

What action, if any, was taken on Mr. Gilmour's proposal I do not know, since I left before the session ended in order to keep another commitment. However, all recommendations and suggestions resulting from the several sessions on nomenclature have to be placed before the International Commission for decision and its decisions will be published at a future date.

Since education is an integral part of The New York Botanical Garden, and since the Editor of *The Garden Journal* must keep informed on what interests the amateur horticulturist as well as the professional, I endeavored to attend as many of the educational and amateur sessions as possible. The paper by R. F. Martyr of Pershire, Worcestershire, England, on "Trends in Horticultural Education in the United Kingdom" had forthright advice, which could be adapted to educational programs in horticulture in this country. Other helpful information on vocational programs in horticulture came from Leslie Laking, Director of the Royal Botanic Gardens at Hamilton, Ontario, and Louis Martin of Los Angeles State and County Arboretum, Arcadia, California (Dr. Martin is now Director of the Denver Botanic Garden), who presented papers at one of the sessions, and from Franklin J. Miller of Niagara, Ontario, Park Commission, with whom I held conversation about the Commission's School of Horticulture. I have visited the School in the past and look forward to visiting it in September, 1967, when the American Association of Botanical Gardens and Arboretums will hold its annual meeting at the Royal Botanic Gardens in Hamilton, Ontario, immediately after the American Horticultural Congress in Cleveland, Ohio.

Eight of the graduates of the School of Horticulture at Niagara, Ontario, hold positions in the United States —one is Chief Horticulturist of the Department of Botany at Penn State University, another is Assistant Superintendent of the Missouri Botanical Garden.

Three events must be mentioned before ending this report. First, the reception—an Hawaiian-party—at the United States National Arboretum with Secretary of Agriculture Orville L. Freeman and Mrs. Freeman as hosts. Charming hostesses in lovely mumus circulated among the one thousand guests. Traditional Hawaiian dances and a musical program were performed and refreshments served in a beautiful setting—the torch-lit lawn before the impressive Administrative Building of contemporary-style architecture. Many were responsible for the occasion—not the least being the Pacific Botanical Gardens Foundation and Mrs. A. Lester Marks of Honolulu.

Then, the banquet of the American Society for Horticultural Science at which, before the nine hundred and seventy guests assembled, the Meyer Memorial Medal was presented to Dr. Russell J. Seibert, Director of Longwood Gardens, Kennett Square, Pennsylvania. On one side of the medal, designed by the well-known sculptor Theodore Spicer-Simeon, is a facsimile of the bas-relief which Queen Hatehepaut of the eighteenth dynasty had executed upon the wall of her palace at Thebes to commemorate the first introduction of a foreign plant—the incense tree from the Land of Punt. On the reverse side of the medal is the name of Frank N. Meyer, for thirteen years Agricultural Explorer of the Office of Foreign Seed and Plant Introduction through whose bequest the medal was made possible; a Chinese inscription which, freely translated, reads "In the glorious luxuriance of the hundred plants he takes delight"; a fruiting branch of the jujube *(Ziziphus jujuba),* one of Mr. Meyer's contributions to economic horticulture, and *Pinus bungeana,* of which he sent thousands of seeds to this country.

Dr. Seibert received this high award from the American Genetic Association as Trustee of the medal, for his significant contribution in the introduction of ornamental plants, his participation in plant exploration, and his contribution as administrator of programs fostering international exchange of ornamental plants. As Director of Longwood Gardens, he is actively associated with the U.S.D.A.—Longwood Gardens Ornamental Plant Exploration Program, which has sponsored ten explorations to Japan, Australia, South America, Europe, Russia, India, and South Korea for new ornamental plant materials. He has also been personally responsible for introductions from South America and South Africa as a result of his visits to those areas.

Mrs. Lyndon B. Johnson was presented a citation "for her interest and efforts in bringing before the American public the very important problems dealing with home, garden, community, and highway landscape beautification. Because of her energy, the entire nation is becoming actively engaged in making this a more beautiful country."

Awards were also presented at the banquet of the American Horticultural Society—the Society's highest honor, the Liberty Hyde Bailey Medal, being given to Alex Laurie of Pine Mountain, Georgia, "for a life time of work in the field of floriculture and ornamental horticulture. As a commercial grower, as instructor and professor at various universities in Maine, Missouri, Michigan, and Ohio; as a horticultural consultant, as an author of several standard texts on floriculture and many scientific papers, as counselor to hundreds of students, he has done much to instruct and guide young people throughout the country in horticultural pursuits."

Citations were given to Alice Wessels Burlingame of Birmingham, Michigan, for her "outstanding work in teaching and supervising horticultural therapy in various institutions . . ."; to Louise Bush-Brown of Philadelphia for her outstanding efforts in founding the Neighborhood Garden Association and in taking an active part in its development"; to Frederic Heutte of Norfolk, Virginia, "for over half a century working with plants and

(Continued on page 258)

THE APPLICATION OF ELECTRONIC DATA PROCESSING METHODS TO BOTANICAL GARDEN AND ARBORETUM RECORDS

By ROBERT D. MACDONALD

Mr. MacDonald presented this paper at the meeting of the International Association of Botanical Gardens, held during the XVII International Horticultural Congress at College Park, Maryland. He is Director of The University of Tennessee Arboretum at Oak Ridge.

ELECTRONIC DATA PROCESSING enters into daily life from every angle. The phone bill is accompanied by an IBM[1] payment card which you must not "fold, clip, staple, or tear," the electric and gasoline bills arrive in the form of perforated IBM cards—you tear off two-thirds of the card and return it with a check for payment. The United States Internal Revenue Service has made it all too clear that individual tax returns are very closely scrutinized by Honeywell computers in one of seven regional service centers.

As you become acquainted with electronic data processing one fact stands out: the incredible growth of data processing equipment in numbers, capability, and availability In some ten years the typical computer system has become ten times smaller, one hundred times faster, and one thousand times less expensive to operate.

In the Botany Department at the University of Tennessee much emphasis, especially in the freshman courses, is given to the realignment of attitudes concerning properties commonly attributed to plants. Most students at first consider plants to have vague, humanlike properties. Plant roots "grow down to reach water because they know it is there." Plant stems "grow toward the sun because they know they need the light." These and other teleological beliefs are shown to be in error through lectures on geotropism, phototropism, and so on.

In what appears ever more increasingly to be the age of computers, we encounter similar problems, even among learned people. Electronic data processing (EDP) machinery does not function through magical processes built around legerdemain, and these machines are not "thinking machines." Most important to remember, these machines do not present some mystical panacea for all problems. They are, however, tremendously important tools.

I have not emphasized the "computer," but electronic data processing "machinery" because the computer is only one of an array of equipment which may be utilized to process plant records. Indeed, there may be little need for a computer for some operations.

First, I should like to mention the basic equipment which is available at most data processing facilities (using IBM equipment as examples):

Most information to be entered into a computer or processed by other EDP machinery must be punched into standard cards with a keypunch (IBM 026). This machine is operated much like an ordinary typewriter. Generally, the data to be punched is first listed on a standard data form so that it may more easily be read by the keypunch operator. There are two methods of checking the keypunching for accuracy. One is to use the IBM 407 tabulator which will provide a printed listing of the data; a visual check of this listing against the data sheet will detect most errors. The other, and more positive check is to use the card verifier (IBM 056). This machine operates exactly as the card punch except that instead of punching the data, it compares, column by column, each keystroke with the card contents. Once the data has been checked and the errors corrected, all chance of future errors from these data has been eliminated.

Two very important pieces of equipment, which save many hours of hand labor for small jobs, are the IBM 083 card sorter and the IBM 407 tabulator. Cards may be arranged in any desired order at the rate of one thousand per minute (one column at a time) by the card sorter. The IBM 407 tabulator can be used as a printer and will list the data contained on the cards. For large listings, a computer would be more efficient.

The computer itself (and a wide range is available) is basically a very fast, versatile calculator. A computer system consists of input-output units (card reader-punches, typewriters, etc.), a control unit which directs the activities of the various components of the machine, an arithmetic unit, and memory units (magnetic cores, magnetic tape, etc.).

Some computers are more versatile than others in the number of basic operations they can perform. According to the computer system utilized, there may also be large differences in the amount of information which can be stored.

The University of Tennessee Computing Center has several computer systems which we utilize in processing our plant records. The IBM 7040 computer, for instance, can execute some one hundred different basic instructions. However, most of our work is done by the IBM 1401 computer system. This is an extremely versatile system; the computer itself provides eight thousand positions of high speed magnetic core storage. The IBM 1402 card read-punch will read up to eight hundred cards per minute and punch up to two hundred and fifty cards per minute. The IBM 1403 printer prints data up to six hundred lines per minute, while the IBM disk file provides up to 2×10^6 characters of random access memory. IBM 7330 tape units are also available.

1. The mention of brand names does not constitute endorsement by The University of Tennessee.

One major area of computer utilization is information retrieval. For instance, it is theorized that at the turn of the century most large universities will have computerized information retrieval libraries. Scientists in all fields will then be able to have the latest papers abstracted by the computer and reproduced in their laboratories.

Since 1949 the World Health Organization has used an international medical certification form to record data pertaining to deaths, their causes, and other significant conditions which were not related to the disease or condition directly causing death. These data are tabulated and retrieved with the aid of computers.

Any arboretum or botanical garden which maintains records on the plants contained in it has a very large problem—the hundreds, no, thousands of file cards of every shape and description which carry all manner of information. The cover of The American Association of Botanical Gardens and Arboretums April, 1966, *Newsletter* shows a number of these file cards.

After visiting a number of arboreta in the United States and examining their record keeping systems, and the number of different cards utilized, I concluded that a better system could be developed. For instance, if you want a simple listing of all the plants in your arboretum or botanical garden and where they are, how long does it take how many secretaries? How about generic or family listings and where the plants were obtained? Or have you ever tried to compile a concise history of the life of a particular plant, a group of plants, or, perhaps ultimately, all plants on record?

The University of Tennessee Arboretum is only a little over two years old, so we do not have a plethora of data to handle compared to other large arboreta—just the data on somewhat over fifteen hundred accessions. However, we are interested in maintaining an accurate biographical record on all accessions—propagation methods used, germination and transplant data, as well as survival and growth when outplanted.

The application of electronic data processing methods to the manupulation of plant records is primarily a matter of information retrieval. Several EDP systems for handling data concerning plants have been developed in this country. We have "borrowed" from two of these systems[2] and have begun to set up an EDP system for our own plant records. The initial format of our system is described in the A.A.B.G.A. April, 1966, *Newsletter*. However, what I described should be more accurately called "Part I" of a two-part system. If we desire to generate listings of our plants by one, two, or even three criteria, this particular method works very well. We can obtain, very quickly, listings of plants by family, genus, location in arboretum, method of receipt (seed, scion, etc.), source, or accession number.

However, we found that this initial format does not go quite far enough. We have, therefore, begun work on what we might call "Part II" of our system, in which we make use of what is called a "document set." Each plant is assigned an unique information retrieval file number—in this case the accession number. The cards containing information about a particular plant comprise a document set. The data is then transferred to disk files or magnetic tape. Information is retrieved through the use of keywords or descriptors relative to the data desired. In this manner we can keep a running history of each plant and are able quickly and accurately to generate information about a single plant or any group of plants.

This system is not yet fully developed, but we anticipate that it will entail the following:

A. A standard input format consisting of a string of required information.

	Example
1. IR file no. (accession no.)	PIST-P-64
2. Family	Pinaceae
3. Name	Pinus strobus pendula
4. How received	Grafted plant, container grown
5. Source	Tenn. Valley Nursery, Winchester, Tenn.
6. Common name	Weeping white pine
7. Author	Unknown
8. Environmental factors	Unknown
9. Biography	Scionwood received from Arnold Arboretum, gallon container March, 1965, outplanted Feb., 1966, plot 77

This information could be punched into cards as:
PIST-P-64,PINACEAE,PINUS,STRØBUS,PENDULA,GRAFT,
CØNTAINERGRØWN,TENNVALNURSY,WEEPING,
WHITEPINE,SCIØN,ARNØLDARB,GALLØNCØNT,
MARCH1965,ØUTPLANTED,FEB1966,PLØT77

B. Logical requests for information:

To retrieve these data the request utilizes keywords. As many descriptors as necessary may be entered in any order. A number of alternatives are possible.

1) A search request for pendulous or weeping plants would generate the above data by indicating:
PENDULA, WEEPING

2) Further, for weeping plants originating as grafts from scionwood obtained from an external source:
PENDULA, GRAFT, SCION

To circumvent the errors which might be perpetrated by plurals, prefixes or suffixes, abbreviations, and spelling, we consider possible combinations of the search request. The logical request could then consist of:
PENDULA, OR, PENDULATE, OR, PENDULOUS, AND, GRAFT, OR, GRAFTED, OR, GRAFTING, AND, SCION, OR, CION, OR, SION, OR, SIGN,

The point is that it is relatively easy to document plant records in such a manner that information retrieval may be accomplished quickly and accurately. An added point is that instead of having the output printed on ordinary paper, it may be printed on multilith paper. By so doing it is possible to print many copies of the desired information without a secretary typing a single line.

(Continued on page 258)

2. Gould, Sydney. 1962. Family names of the plant kingdom. International Plant Index, Vol. I. Box 1106, New Haven, Conn.
Reed, M. J., W. R. Powell, and B. S. Bal. 1963. Electronic data processing for California wildland plants. U. S. Forest Service Research Note PSW-N20.

COURSES, LECTURES, AND OTHER GARDEN EVENTS

(For detailed information about a particular event or course, write or phone LU 4-8500)

CHILDREN'S PLANT WORKSHOP (3 sessions) —Saturday morning class, 10:30-11:30 a.m. Starts November 5, 1966. Instructors—Mrs. F. R. Heuberger, Mrs. S. Lasker, Mrs. F. S. Levi, Jr., and Mrs. R. G. Reimss.

CHRYSANTHEMUM SHOW in the Conservatory of The New York Botanical Garden November 5-20, 1966.

"WILD FLOWER TRAILS IN PALISADES INTERSTATE PARK" — illustrated Saturday Afternoon Lecture by Alice and Glenn Foss on November 5, 1966.

"TAHITI: ITS PLANTS AND PEOPLE"—illustrated Saturday Afternoon Lecture by Dr. Lindsay S. Olive on November 12, 1966.

THEATER BENEFIT sponsored by the Women's Council of The New York Botanical Garden—motion picture "Hawaii" at the DeMille Theater, New York City on the evening of November 15, 1966.

"PLANTS OF THE CARIBBEAN" — illustrated Saturday Afternoon Lecture by Dr. Jerome Metzner on November 19, 1966.

"ICELAND WITH SIDE TRIP TO GREENLAND" —illustrated Saturday Afternoon Lecture by E. Dorothy Swindells on November 26, 1966.

ADVANCED BOTANY I (4 sessions)—Monday evening class, 8-9:30 p.m. Starts November 28, 1966. Instructor — Dr. H. N. Moldenke.

"GESNERIAD HUNTING IN THE ISLAND OF JAMAICA" — illustrated Saturday Afternoon Lecture by Mr. and Mrs. Alfred Katzenberger on December 3, 1966.

"SPACIOUS REGION AROUND LEPUY, FRANCE" — illustrated Saturday Afternoon Lecture by Alice Dustan Kollar on December 10, 1966.

CHRISTMAS SHOW in the Conservatory of The New York Botanical Garden, December 10, 1966-January 8, 1967.

ILLUSTRATED LECTURES sponsored by the Women's Council — 4 weeks beginning January 5, 1967. (See announcement on inside back cover, this issue.)

EVERGREEN TREES AND SHRUBS (8 sessions)—Saturday morning class, 10 a.m.-12 noon. Starts January 7, 1967. Instructor—Eleanor Yarrow.

ADVANCED BOTANY II (4 sessions)—Monday evening class, 8-9:30 p.m. Starts January 9, 1967. Instructor—Dr. H. N. Moldenke.

ARTIFICIAL LIGHT GARDENING (3 sessions) —Tuesday evening class, 8-9:30 p.m. Starts January 10, 1967. Instructors—Mr. and Mrs. Alfred Katzenberger.

The Chrysanthemum Show opens in the Conservatory at The New York Botanical Garden on November 5 and continues until November 20, 1966. Here are scenes from the show in November, 1965.

At right, one of the trained shepherd dogs guards the outdoor plantings of chrysanthemums.

The Saturday Afternoon Lectures will be given in the Auditorium of the Museum Building at 3:15 p.m., preceded by a half hour of recorded music.

Admission to the Saturday Afternoon Lectures, 25 cents. Free to members of the Garden (upon presentation of membership card) and free to children under twelve years of age who are accompanied by an adult.

Fee $1.00 per person for Nature Walks.

For fees of the courses, and where they are given, see the Educational Program.

Mrs. Albert D. Lasker pins corsage of orchids, grown at The New York Botanical Garden, on Mrs. Lyndon B. Johnson's jacket, while Mrs. David Rockefeller looks on. Charles B. Harding, President, and Dr. William C. Steere, Director, of The New York Botanical Garden stand in the background.

Upper right. Mrs. Lyndon B. Johnson holds the presentation copy of *Wild Flowers of America*, Volume I. At her left is Mrs. David Rockefeller.

Lower right. Mrs. Hermann G. Place, Vice President of The New York Botanical Garden, with Mrs. Lucien B. Taylor at the press reception for *Wild Flowers of America*.

NEWS, NOTES and COMMENTS

Wild Flowers of the United States, Volume 1, was presented to Mrs. Lyndon B. Johnson for the White House Library at a reception held in the Union Carbide Building on September 16, 1966. The presentation copy was made by Mrs. David Rockefeller. In acknowledging the presentation copy, Mrs. Johnson said:

Let me assure you that this book is going to be in daily demand at the White House Library. It is just the kind of meaningful reference that we have been needing. And I am sure that every future inhabitant of the White House will be proud to have one and—may I hope—the future four volumes—so she may turn to the section from which she would come.

I wish this edition on the Northeast had been out several weeks ago, when I returned from New England and wanted to look up the name of the lavendar-blue fireweed, the white wild roses, and the white fall asters, which I saw along the highway. I had to search the knowledge from the memory of friends instead.

Dr. Rickett has taken on a tremendous chore—cataloging, in non-technical terms, the wild flower population of this country. He tells me that it is almost 20,000 varieties.

But the result is well worth the effort. Here we have a treasurehouse of knowledge in language the layman can understand and pictures which entice him to learn more.

There is a thirst and appetite in this country to learn more about our land and its bounty of wild flowers. We are grateful to Mrs. Rockefeller and to this organization for making possible the magnificent color plates in this book, which bring it all to life.

Here, between the pages, we have both an answer and a challenge. It is just the kind of project which an outstanding organization such as The New York Botanical Garden should be undertaking. I hope it foretells of more such far-sighted endeavors to lead to enhancing the beauty of our neighborhoods and countryside.

There is an upsurge of interest and action to do something to make our towns more liveable. Today, towns all over the country—governors, mayors, civic groups—are looking to people like you (The New York Botanical Garden)—the experts—for guidance in enhancing the beauty of their environment.

I know that the Garden—with its record and evidence—will rise to that challenge.

Charles B. Harding, President of The New York Botanical Garden, presided at the ceremony and, introducing Mrs. Johnson, said:

Mrs. Johnson, it is most fitting to have you as our guest of honor today. Your great interest in conservation and reclamation and your enthusiasm for the wild flowers which decorate our land surely identify you as an outstanding proponent for beautification of our country.

The long-awaited publication of *Wild Flowers of the United States* is not only an aesthetic accomplishment in publishing but, more important, it is in a spirit which will rekindle the American people's innate love of the land and its beauty.

It is the hope of The New York Botanical Garden that this book will challenge the ugliness and neglect which have begun to mar our woodlands and country side. We trust that it will generate action for the preservation of wild flowers as cities encroach upon the land beyond cement and gravel landscape.

Mr. Harding also introduced Mrs. John V. Lindsay, wife of the Mayor of the City of New York, Mrs. Albert D. Lasker, Chairman of the Reception Committee, Mrs. David Rockefeller, Chairman of the Committee on *Wild Flowers of the United States*, and Dr. William C. Steere, the Botanical Garden's Director. Dr. Steere made the following remarks:

Almost everyone recognizes the importance of plants for human existence—for food, for shelter, for clothing, for medicine, and so on, through a long list. However, too few people realize that plants are fundamentally essential for the very existence of man and all other animals, because of their unique ability to transform the energy of sunlight into the food which sustains all life. Those of us who are conservation-minded recognize the dramatic fact that if man continues to destroy the plants upon which he and all other animal life depend, he simply destroys himself.

Man is not heroic or grandiose about his self-destruction. Far from it, he is untidy, unbeautiful, and wholly disgusting as he erodes his environment; he is the only

"bird" which fouls its own nest. He suffers from diseases he himself spreads in polluted water supplies, and he strangles in his self-poisoned, smog-ridden atmosphere. I think you will agree that humans suffer rather badly by comparison with other animals, in respect to treatment of environment. However, all is not lost, and man's strong urge for survival as well as his creative instincts should lead us to improve our environment instead of devastating it. Our distinguished guest of honor today, Mrs. Johnson, has brought strong leadership to an important aspect of conservation in her vigorous support of the beautification of American landscapes and roadsides. This program again highlights the importance of plants in human values.

Plants are the central and basic concern of botanical gardens in general, and of The New York Botanical Garden in particular—their collection, their culture, and their display, as well as scientific research on them and the dissemination of information about them. For seventy-five years The New York Botanical Garden, more than any other institution in the world, has sponsored the production and publication of books designed for the identification—that is, the naming or classification—of plants of the Western Hemisphere, and especially of the United States. Most of these books have been produced for professional specialists on plants, for advanced amateurs and for students. Many of you here today have used Britton and Brown's *Illustrated Flora of the Northeastern United States and Adjacent Canada,* a three-volume work published by The New York Botanical Garden in several editions, and recently condensed into one convenient volume by Dr. Cronquist. Many other handbooks written by staff members cover areas such as the prairies and plains of our central states, the Rocky Mountains, the Great Basin, the Pacific Northwest, California, the southeastern United States, Bermuda, the Bahamas, Puerto Rico, and the highlands of northeastern South America—not to forget New York City and vicinity.

Today, then, we are celebrating the culmination of a long tradition at The New York Botanical Garden, our professional obligation to produce and publish books on plants, in the service of science and of mankind. The books we honor today are the first of a five-volume work which will eventually cover all the wild flowers of the contiguous United States, under the authorship of a prominent botanist, Dr. Harold William Rickett. With long experience as a teacher and writer, Dr. Rickett has exceptional ability to set forth accurate scientific facts in clear and nontechnical language; he has created a fascinating and helpful text which is magnificently illustrated. In this first volume, as in the four still in various stages of completion, Dr. Rickett makes a very great contribution to science and to mankind. His beautiful work will be particularly useful to those conservation-minded and public-spirited persons who have conceived the vision of beautifying our nation with plants.

I take great pleasure in introducing a colleague and friend, the author of this magnificent work, Dr. Rickett, Senior Botanist of The New York Botanical Garden."

Dr. Rickett paid tribute to all who contributed to the preparation of the first volume of the Wild Flower Series without which, he said, his task as editor would have been most difficult.

The reception marked the opening of the exhibit of enlargements of some of the colored photographs and black and white drawings which illustrate the first volume. The exhibit continues until October 7, 1966.

Activities of the Director and Staff. During the past two months Dr. William C. Steere, Director, attended the press preview on the occasion of the opening of the exhibit introducing the first volume of *Wild Flowers of the United States,* held at the Union Carbide Building, New York City, and spoke at the reception at which Mrs. Lyndon B. Johnson accepted a presentation copy of the above volume for the White House Library. Dr. Steere attended meetings of the Committee on Research in the Life Sciences under the auspices of the National Academy of Sciences, of the Finance Committee of the XI International Botanical Congress to be held in Seattle, Washington, in 1969, and of the Executive Committee and the Board of Trustees of Biological Abstracts, held in Los Angeles, California; also the Northeast Museums Conference which was held in Newark, New Jersey. He addressed the Little Gardens Club of New York City on "Gardens of South America" and will lecture before the Horticultural Society of New York on "Guatemala" on November 16, 1966.

Dr. Clark T. Rogerson was elected Vice-President of the Mycological Society of America at its annual meeting held in conjunction with the American Institute of Biological Science meetings at the University of Maryland, College Park, in August. President-elect is Dr. Emory G. Simmons of the United States Army Natick (Mass.) Laboratories.

Dr. Alma Barksdale, Senior Research Associate, attended the annual meetings of the Mycological Society of America and the Botanical Society of America, held during the A.I.B.S., meetings at The University of Maryland.

Dr. Howard Irwin, Associate Curator, returned to the Garden on August 15, 1966, after spending a year in the field in Planalto do Brasil. John W. Greer, Jr., graduate student at the Garden, joined the field party from January until June. Headquarters were at the Departamento de Botanica, Universidade de Brasília. The work consisted of a series of excursions of one to two weeks duration to selected localities in southern Goias and adjacent Bahia, Minas Gerais, and Mato Grosso. Periods between these forays were devoted to continued intensive collecting in the Federal District. In all 10,500 collections were taken, each averaging seven duplicates. Several sites were revisited two and three times to assure as complete a representation as possible.

In the final excursion, to northeastern Mato Grosso, the party was joined by three naturalists from the Royal Society, London, who were looking for a site on the new Brasília-Manaus highway to establish a biological station. Brazilian institutions, especially the University of São Paulo and Brasília, are similarly interested in setting up study centers in the newly accessible hinterland.

The University provided an apartment for Dr. Irwin and his family. His two daughters attended the American school in Brasília where Mrs. Irwin taught English and history.

Dr. Irwin plans to return to the field late in 1967 or early 1968.

Dr. Caroline Allen, Research Associate, left October 1, 1966, for Brazil where she will engage in field investigations of *Lauraceae* with headquarters in Manaus. From November 1 until December 1 Dr. Allen will continue field work in Trinidad and Tobago.

Dr. Harold W. Rickett, Senior Curator of Botany, left on September 19, 1966, for England—Ipswich mostly, where he conferred with W. S. Cowell Ltd. The manuscript of Volume 2 of the *Wild Flowers of the United States* has gone to the printers and most of the plates; Dr. Rickett has seen proofs of about half the number of plates. He will continue on to Utrecht in October to attend the meeting of the Glossary Committee on Nomenclature of the International Botanical Congress.

John F. Reed, Curator of the Library, advises that conversion to the Library of Congress classification has begun. All new books added to the collection are being classified in this manner, and considerable recataloging of books within the collection is being done. All cataloging copy is being submitted to the *National Union Catalog* at the Library of Congress in Washington, D. C.

The Gertrude S. Burlingham Scholarship in Mycology has been awarded to Henry Dissing of the Institut for Sporeplanter of the Botanish Laboratorium of Kobenhaven, Denmark. He will arrive at the Garden in March, 1967, for three months study of Discomycetes.

Dr. Wesley Niles, formerly with the Department of Botany of the University of Arizona, began work on September 15, 1965, on volume 3 (southwest) of the *Wild Flowers of the United States,* replacing June Beasely.

Mrs. John D. Beals, Chairman of the Friends of the Children's Gardens, presented certificates to 185 young people in the presence of a large gathering of relatives and friends at the graduation exercises on September 10, 1966. Lillian Weber presided at the exercises held in the Auditorium of the Museum Building of The

New York Botanical Garden. T. H. Everett, Assistant Director (Horticulture) and Senior Curator of Education, spoke a few words about the program of the children's gardens. Norma Krieger, known as "Queen of Magic," entertained the gathering through the courtesy of Jerome A. Lukins.

VISITORS TO THE GARDEN

Members of the Ukrainian Academy of Arts and Sciences in the United States, visited the Garden this past summer and were escorted through the grounds by Elizabeth C. Hall, Associate Curator of Education. In the party were Dr. A. Archimovych, President of the Academy, who has donated numerous reprints to the Garden's Library, and Dr. Natalia Ossadcha-Janata, specialist in the field of medicinal herbs. Mrs. Ossadcha-Janata spent some time in the Garden's Herbarium, during which time she contributed an article on "Herbs in Ukrainian Folk Medicine" to *The Garden Journal* (November-December, 1952, and January-February, 1953).

Richard Zandor, Duke University, Durham, N. C., spent a month at the Garden in the study of bryophytes.

Dr. Richard T. Hanlin, Georgia Experiment Station, Experiment, Georgia.

Dr. Emory G. Simmons, Mycology Laboratory, Pioneering Division, U. S. Army Laboratories, Natick, Mass.

Dr. J. Subbaya, College of Agriculture, Hyderabad, India.

Dr. D. Yopala Raji, College of Agriculture, Baptala, A. P. India.

Dr. Rudolf Schmid, Botany Department, University of Michigan, Ann Arbor.

Dr. T. F. Eifert, University of Texas, Austin.

Dr. F. J. Breteler, Wageningen, Holland.

Phyllis Smith, Department of Botany, University of Edinburgh, Scotland.

F. J. King, State University College, Genesee, New York.

Dr. Wilbur H. Duncan, Department of Botany, University of Georgia, Athens.

Mr. and Mrs. Keith Roe, Department of Botany, University of Wisconsin, Madison.

Allan Andrews, Fulton Montgomery Community College, Johnstown, N. J.

Dr. W. H. Eshbaugh, Department of Botany, Southern Illinois University, Carbondale.

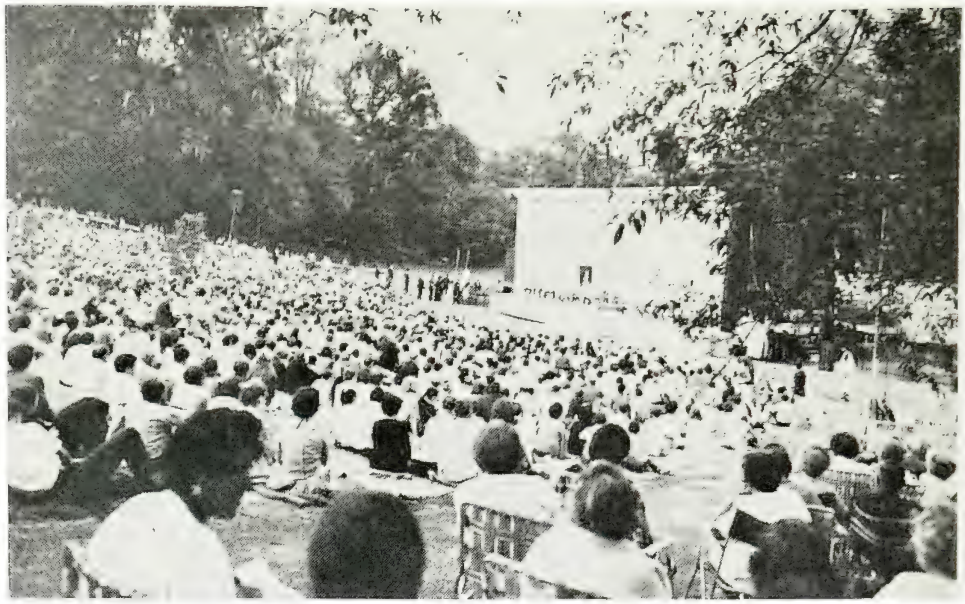
Dr. Derek Burch, Missouri Botanical Garden, St. Louis.

Edward Clebsch, University of Tennessee, Knoxville.

Philip Buerkel, Agricultural and Technical Institute, State University Farmingdale, New York.

Dr. and Mrs. James Kimbrough, University of Florida, Gainesville.

Arthur M. Anderson of Bedford Hills, New York, died on August 9, 1966, at the age of eighty-five. Mr. Anderson was elected a member of the Corporation of The New York Botanical Garden and of the Board of Managers on January 9, 1933; he resigned from the Board of Managers on November 29, 1959, but remained a member of the Corporation until his death. Mr. Anderson served as treasurer of The New York Botanical Garden from May 1938-May 1952. He was also a life member of the Garden and a contributor to the restoration of the Snuff Mill and the Harriet Barnes Pratt Library Wing.



A large audience assembled on Daffodil Hill at The New York Botanical Garden on the evenings of August 4 and 12, 1966, for concerts by The New York Philharmonic. Lukas Foss is conducting and Marian Anderson narrating "A Lincoln Portrait" by Copland.

Mrs. Robert D. Sterling, of New York City and Dublin, New Hampshire, died on June 10, 1966, in her ninetieth year. Mrs. Sterling was a long-time member of The New York Botanical Garden, of the American Museum of Natural History, The Garden Club of America, and other organizations. She was seriously interested in conservation and shortly before her death established the Anna M. Rockefeller Fund of The Garden Club of America to aid its Conservation Educational Packet. Her gift carried the stipulation that any or all of this fund could be used in educating young people in the field of conservation.

The Horticultural Society of New York has appointed Ira Caplan Executive Director, succeeding Richard Farnham who retired on July 1, 1966, after seventeen years as Executive Secretary. Mr. Farnham will conduct a horticultural advisory service from his home in Middle Neck, New Jersey.

Mr. Caplan, who assumed his duties September 1, 1966, has been Extension Agent of the Cooperative Extension Service of Cornell University and Rockland County, New York.

Thomas B. Powell was designated Administrative Director. He and Mrs. Powell have been co-editors of the Society's Bulletin since 1964, and he has been involved in the monthly flower shows at the Essex House and in the garden tours conducted by the Society.

Lorenzo P. Parodi, Professor Emeritus of the University of Buenos Aires, Argentina, one of the great botanists of this hemisphere, died on April 21, 1966. He was known to members of the Garden's Staff, and the Director, Dr. William C. Steere, has enjoyed association with Prof. Parodi for more than thirty-five years.

Plant Science Bulletin, the official publication of the Botanical Society of America, called attention to an article "Plant Growth as a Cancer Cure" by Solomon Garb, M. D., in the May 7, 1966, issue of *Saturday Review*. Dr. Garb presented examples in which the chemical growth inhibitors secreted by certain plants inhibit the growth of certain other plants. He discussed such substances from *Anemone pulsatilla, Artemisia absinthium, Bergenia crassifolia, Encelia farinosa, Juglans nigra,* and *Sorbus* sp. Dr. Garb suggested that since plants show promise of anti-cancer activity, there should be sup-

port from government agencies for further research along these lines.

Vinca rosa has shown some curative value in certain types of leukemia. The National Cancer Institute has screened more than fifteen hundred plants as possible cancer cures, as reported by Nelson Coon in the July-August issue of *The Garden Journal.*

The Handbook on Garden Pests, of which Dr. Cynthia Westcott is guest Editor, may be obtained from the Brooklyn Botanic Garden, Brooklyn, New York 11225, at $1.25 per copy. This is a successor to the handbook on this subject published in 1955, with completely new information based on research and experience accumulated during the past ten years.

The Original Water-Color Paintings by John James Audubon for the *Birds of America* have been published in two volumes by the American Heritage Publishing Company, in cooperation with The New York Historical Society which purchased, through public subscription, Audubon's collection from his widow in 1863. American Heritage photographed the entire collection at the Historical Society, and the color lithographs were printed by The Lakeside Press.

The 852 pages are of heavy vellum, acid-free; most of the 431 pictures are full page prints, only 57 pages carry two prints, and 64 pictures cover two pages. The last are printed on one sheet, sometimes as a "gatefold", to avoid a break in the picture's center.

Dr. Harold William Rickett, Senior Curator of Botany at The New York Botanical Garden, was one of the three consultants in botany, ornithology, and art history. He furnished the common and scientific names of all identifiable plants in the water colors.

Houghton-Mifflin Company of Boston is the distributor of this remarkable work, the price of which is $75.00.

American Heritage has also produced a numbered edition, limited to 750 copies of unbound prints. This set of the prints, printed on flat sheets of extra heavy paper, comes in a walnut cabinet with two drawers for storing the prints and an easel-backed top to facilitate display of the pictures. The top can be lowered to lie flat when not in use. A black-and-white, text-only edition of the book accompanies the prints. This collector's edition is available, until depletion, from American Heritage Publishing Company, Inc., 551 Fifth Avenue, New York, New York 10017.

The Christmas Show will be held in the Conservatory of The New York Botanical Garden from December 10, 1966—January 8, 1967. Above are views of the 1965 Christmas Show.

The R.H.S. Colour Chart. The first colour Chart published by the Royal Horticultural Society was prepared by Robert F. Wilson and appeared in two volumes in 1941. All plants receiving awards from the Society since then have been described with reference to the color name and its number in the Chart.

Experience during the past twenty-five years has, however, indicated some ways in which the Horticultural Colour Chart might be improved. In the old chart the paler tints of some of the colors were, as a result of the halftone method of printing, too close for easy distinction. Some of the color names used were meaningless to many people, and the numbering systems in the two volumes were different. When the stock of the Horticultural Colour Chart began to run out, it was decided to produce a new chart in which the faults of the earlier one could be avoided.

The fan arrangement of the leaves was accepted as being the most convenient. While the size of the leaves has been reduced in the new chart, the size of the color patch remains the same. A new method, developed by the McCorquodale Colour Display Company of London, has been used in printing the new chart. Each color is mixed separately and led down by a separate duct on to the paper.

The colors are arranged in spectral order, starting from yellow and proceeding through orange, red, purple, blue, green, and back towards yellow, at the end of the third fan. The fourth fan includes colors which were difficult to place in the other fans, being less clean or more grayed, and therefore making a rather abrupt break in the sequence of the other fans. Many of these colors, including the browns, the grayed reds and purples, whites, grays and

blacks, were not included in the old chart.

Each colour, numbered from 1 to 202, has four tints, lettered A, B, C, D, each becoming progressively lighter in tint. In order to give some idea of the position in the spectrum of a particular number, i.e., whether No. 87 means green or red, the leaves have been classified by "colour groups"—yellow group, red group, etc. In order to define the color a little more closely, intermediate "colour group" names were also given, i.e., yellow-orange group, orange-red group, etc.

The price will be about $12.00 and may be ordered from The Royal Horticultural Society, Vincent Square, London, S.W. 1, England.

Alfred J. Fordham, who has been propagator at the Arnold Arboretum, Jamaica Plain, Massachusetts, for eighteen years, was awarded the Jackson Dawson Medal by the Massachusetts Horticultural Society "for following in the footsteps of famous propagationists at the Arnold Arboretum and doing much to maintain the high standards set by them years ago in this often difficult and sometimes most perplexing art."

Clarence S. Godschalk, who recently retired as Director of the Morton Arboretum, Lisle, Illinois, received the Thomas Roland Medal "for meritorious work in the planning and development of the Morton Arboretum, and for his direction and leadership since its founding . . ."

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A Seven-Year Quest for a Flower. *Lilium washingtonianum,* scattered through the Sierra Nevada and Cascade Ranges to Mt. Hood in Oregon, still flourishes in a few places, is losing ground in most, and has long since disappeared in too many. Bears dig its bulbs for food, as the Indian once did. Squirrels and chipmunks fancy the fresh, emerging leaves in the spring. Deer graze on the buds and flowers as well as the leaves. Insects may drill holes through the waxy, white petals. In dry years the buds may shrivel before opening. Highway engineers have routed a Yosemite High Country new road dead-center through the lily slopes near Mt. Hoffmann. On Mt. Shasta the United States forest Service has bulldozed one of the best lily and brush thickets for a test plot for pine.

Charles C. Johnson, photographer for the Wild Flower Books, was busy on Mt. Rainier, Mt. Baker, and the Olympic Peninsula when *L. washingtonianum* bloomed five hundred miles to the south. Hot weather brought early blooming this year. The airlines were on strike; commercial flower shipments in California were being dumped.

But the seven-year determination of Johnson's devoted flower-finders, the Hamanns of Rabbit Hill, Middletown, California, to bring the lily and the photographer to the same spot at the same time succeeded on August 6, 1966, in Seattle. After seven years of all the above-listed lily hazards, the generously shared knowledge of botanists and the enthusiasm and footwork of lily searchers, alerted by the Hamanns over a six-hundred-mile arc of mountains, at last presented a workable specimen to the photographer. With the early season opening blooms one jump ahead of planned collecting, the seemingly last possible stalks of the year were won by the Huffords, ranchers of Whitmore, California. They found them six thousand feet up on their summer pasture on Clover Mountain, fifty feet below the summit and its snow. Packed in snow, brought down by jeep to the home ranch, protectively packaged in plastic, boxed, and taken by car to Redding thirty miles away, the delicate lily traveled the unlikely conveyance of a Greyhound bus to Seattle and the long-planned offering of its beauty to Charles Johnson's photographic skill. Some day it will bloom again in Volume 4 of the Wild Flower Books.

The Mohonk Trust. A tract of land, consisting of 487 acres and including the famous Trapps Cliffs and other spectacular mountain scenery, was acquired by The Mohonk Trust in August, 1966. This initial transfer of property from the Lake Mohonk Corporation to The Trust is the forerunner of what is expected to total about six thousand acres; the remaining fifteen hundred acres of the Smiley Estate to continue with the Corporation for the operation of Lake Mohonk Mountain House.

One of the primary objectives of The Mohonk Trust, which was established in February, 1963, is "to preserve the unspoiled natural beauty of the Shawangank Mountains for recreational and inspirational use and thus set patterns, elsewhere, in safeguarding the esthetic qualities and irreplaceable resources for the benefit of future generations.

Its second objective is "to promote world order and aid international understanding through an educational process of conferences and informal exchange of ideas by individuals and groups in a lovely natural setting conducive to free discussion and thus revive and strengthen fundamental values in the lives of the participants."

Gifts, which are tax deductible, may be sent to The Mohonk Trust, Mohonk Lake, New Paltz, New York.

On Holly. Paul R. Bosley, nurseryman and holly specialist of Mentor, Ohio, interviewed by Irma Bartell, Garden Editor of the *Cleveland Plain Dealer,* gave her some cultural information about holly which answers questions from our readers.

"Holly may be planted almost any place on home property, but I do not recommend planting it in a windy corner of the house or opposite a breezeway where it is likely to receive a concentration of winter wind when frozen.

"Holly may be used as an interesting accent in foundation planting or as a lawn

(Continued on page 257)

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BOOK REVIEWS

READINGS IN ECOLOGY. Kormondy, Edward J. (ed.). 219 pages. Prentice-Hall, Inc., Englewood Cliffs, N. J. 1965 (rec'd 1966) Paper $3.95.

The editor's preface highlights two major flaws in this supplemental text for ecology students. The omission of the original literature citations from this select grouping of original contributions as a space-conserving measure is the more serious of these flaws. It would have been far more effective to eliminate one of the chosen papers, include the original citations, and permit the reader to determine the dependency of the original author on the work of other scientists—this would be particularly true in the case of the more recent material chosen for inclusion in the text. The second major flaw is that each of the original contributions has been highly abridged, again the only justification being the conservation of space.

One cannot quarrel with the editor's choice of selected papers since in his own words, "No two ecologists would likely develop identical lists nor present them in the order used here." Beginning with a contribution from Theophrastus in c. 300 B.C. from his two-volume *Enquiry into Plants* and terminating with Margalef's "On certain unifying principles in ecology," published in 1963, the articles have been chosen primarily on the basis of having made a significant contribution to ecology. As a result of this criteria, the editor has succeeded in naming many who at one time or another have helped to shape the field of ecology—for example, under a general heading "The Study of Communities," one finds such names as Warming, Cowles, Clements, Braun-Blanquet, Gleason, and Cain. Each of the abridged articles, as well as the section headings, is preceded by a brief comment by the editor which is often used to indicate controversial portions of the material and to cite references to opposing points of view. Unfortunately, this technique does not make up the deficit of omitting the original literature citations. This brief volume should be excellent reading for the general biology student or layman interested in the historical development of the field of ecology. The graduate student, however, as will any other serious reader, will find he must return to the original material.

RONALD R. DAGON

THE MORPHOLOGY OF GYMNOSPERMS. Sporne, K. R. 216 pages, illustrated, indexed. Hillary House, New York, N. Y. 1966. $3.00.

This little book fills a definite need. Much has been learned about gymnosperms especially the fossils, since 1935, yet this is the first new book in English about the group as a whole since that time. Only a few years ago an obsolete textbook was reprinted without change, long after the author's death, in order to make something available to students. Now in this well-written new work the author has attempted a synthesis of the available information into an interpretative understanding of the group, with due regard for some continuing differences of opinion. It is a good job well done. The casual reader should be warned, however, that the author assumes an initial knowledge of basic plant morphology. If words like gynoecium, mesarch, micropyle, and prothallus throw you, the book is not for you.

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INCOMPATIBILITY IN FUNGI. Esser, Karl & Raper, John R. (eds.). viii + 124 pages, illustrated, stiff paperback. Springer-Verlag-New York, Inc. 1965. $6.00.

Great strides in the study of fungous genetics and sexual reproduction in fungi have taken place in recent years. The need for a synthesis of the scattered information in the field brought about the organization of a symposium held at the Tenth International Congress of Botany at Edinburgh in 1964. This book includes the papers presented at the symposium. Each of twelve contributors has reviewed and summarized his own particular specialty. Excellent discussions on heterogenic and homogenic incompatibility, mating-type locus in Ascomycetes, tetrapolar incompatibility, somatic recombination and selfincompatibility and heterothallism in Basidiomycetes, nuclear migration, recombination systems, etc., are included. The book is a worthy contribution to fundamental knowledge of the fungi.

CLARK T. ROGERSON

ADVANCES IN PEST CONTROL RESEARCH, Vol. VI. Metcalf, R. L. (ed.). 289 pages, illustrated, indexed. Interscience Publishers, Div. John Wiley & Sons, New York. 1965. $11.00.

The latest volume in this series contains several notable articles of interest to advanced students in the respective fields. Among these are "Natural Models for Plant Chemotherapy" by A. E. Dimond, "Genetic Studies on Insecticide Resistance" by G. P. Georghiou, and "Penetration and Translocation of Rogor (dimethoate) Applied to Plants" by P. de Pietri-Tonelli.

P. P. PIRONE

PESTICIDES IN CLINICAL PRACTICE. Brown, Royal L. 492 pages, reference. Charles C. Thomas, Springfield, Ill. 1966. $15.75.

About eight thousand four hundred com-

mercial pesticides now being widely used are listed in the main body of the text. The most valuable section, particularly for physicians, describes the treatment, lethal dose, signs and symptoms, and pathology of thirty-one groups of pesticides. This book should also be helpful to workers directly connected with the manufacture, distribution, and application of pesticides.

P. P. PIRONE

FLOWER AND GARDEN PHOTOGRAPHY. Fenten, D. X. 128 pages, illustrated (part color), indexed. Chilton Books, Philadelphia, Penna. 1966. $4.95.

Mr. Fenten's book is a good guide for those interested in flower and garden photography. It is primarily meant for the amateur, although it has excellent details, such as charts and tables, which should prove useful for the professional as well. The choice of the many color and black and white illustrations indicates sound judgment on Mr. Fenten's part. Among these illustrations Mr. Malak's photos are particularly outstanding. In connection with the excellent illustrations, detailed photographic data would have added much to their usefulness: choice of camera, type of film, speed, etc.

It is hard to understand how such a fine book was not proofread more carefully; this would have made it an excellent book. Again and again, some unfortunate errors are found: on page 96, roses are called carnations; page 42 has not only the wrong name, but even the wrong name is misspelled—the anthurium is actually a spathiphyllum; on pages 48 and 49 the color photo of *Lilium* 'Georgia Belle' is upside-down and the same goes for the day-lily photo on page 76. When using botanical names it is wise to check first for accuracy, otherwise it is advisable to use the common name; on page 38, these are not *Cymbidium* orchids. In the chart on page 27, Color Reversal Films, Kodachrome II is wrongly listed as 50ASA—it should read 25ASA.

Perhaps these and similar errors can be corrected in a future printing. All things being equal, it is a handy little book to have on the shelf.

WALTER SINGER

SPORES: THEIR DORMANCY AND GERMINATION. Sussman, Alfred S. and Harlyn O. Halvorson. 354 pages, illustrated, indexed. Harper and Row Publishers, New York, N. Y. 1966. $14.00.

The spores of microbes and fungi are tiny bodies which are released from their parents into soil, air, and water, where they endure and in time may germinate and reproduce their kind. It is with the dormant state of these spores and the stimuli that awaken them to growth that this book is concerned. The authors are biochemists, one of whom, Dr. Sussman, has experimented with spores of fungi, and the other, Dr. Halvorson, with the spores of bacteria. The book is written for the advanced student of microbiology.

ALMA W. BARKSDALE

BRIEF NOTES ON RECENT BOOKS

FLORA

FLORA OF BERMUDA. Britton, Nathaniel Lord. 585 pages, illustrated, indexed. Hafner Publishing Co., New York, N. Y. 1965. $12.00.

This is a facsimile of the 1918 edition.

FLORA OF THE HAWAIIAN ISLANDS. Hillebrand, W. F. 673 pages, indexed. Hafner Publishing Co., New York, N. Y. 1965 (rec'd. 1966). $20.00.

This is a facsimile of the edition of 1888.

FLOWERS

PRIMROSES AND SPRING. Klaber, Doretta. 125 pages, illustrated, indexed. M. Barrows & Co., New York, N. Y. 1966. $4.50.

The author has grown most of the primroses she describes and illustrates with her own pen and ink sketches—"European Mountain Primulas," "Garden and Florist's Auriculas," "Asia Woodland Primulas," "Candelabra and other Bog and Meadow Primulas."

THE ROSE TODAY—A SELECTION OF MODERN VARIETIES. Painted by Prins, Johanna M.C., Introduced by Gerd, Krussmann. Unnumbered, illustrated (part color). Taplinger Publishing Co., New York, N. Y. 1966. $14.95.

Mrs. Prins shows the modern rose as she views them with the eyes of an artist—in other words, she has painted eighteen varieties which she selected as being particularly characteristic, by shade or shape, of today's roses. Any one of the lovely full-page (16″ × 12″) reproductions are worthy of being framed. They are preceded by Gerd Krussmann's introduction, and by line-drawings and brief descriptions of the eighteen roses—each rose being allotted a full page.

What a beautiful gift for a rosarian!

THE BOOK OF OLD ROSES. Stemler, Dorothy. 63 pages, illustrated, indexed. Bruce Humphries, Boston, Mass. 1966. $4.95.

The author has a unique background in old roses, for she worked closely with Frank and Marjorie Lester and Will Tillotson, specialists in old and rare roses. Upon Mr. Tillotson's death, Mrs. Stemler inherited his business and continued the budding of thousands of roses each year and the catalog which has been described "as a work of art rather than of commerce."

Her charming style and approach to roses are evident in this compact book, which covers cultural requirements, derivation, history, and other pertinent information, all of which add to the interest of these roses when grown in the home garden.

FLOWERS IN THE WINTER GARDEN. Graff, M. M. 203 pages, illustrated, indexed. Doubleday & Company, New York, N. Y. 1966. $4.95.

With twenty years of experimenting behind her, Mrs. Graff is well able to tell the beginner and the more advanced gardener how he can enjoy bloom from autumn through early, mid, and late winter. She achieves contrast during this period from colchicums, crocuses (from more than sixty species of *Crocus*, in fact), eranthis, galanthus, bulbous irises, leucojums, early narcissi, species tulips; and from shrubs such as *Cytisus kewensis, Daphne genkwa,* ericas, *Hamamelis mollis, Skimmia japonica, Viburnum fragrans*—to name a few picked at random from the pages of her interesting book. She offers helpful hints on care and maintenance.

Mrs. Graff's interest was stimulated by a noted plantsman, the late William N. Craig, and has been encouraged by the staff of the Brooklyn Botanic Garden.

SHRUBS

RECOGNIZING NATIVE SHRUBS. Grimm, William Carey. 319 pages, illustrated, indexed, glossary. Stackpole Books, Harrisburg, Penna. 1966. $7.95.

With line-drawings, non-technical keys, and brief but clear descriptions, botanist William Grimm makes it possible for the layman to identify native plants from Canada to the Gulf Coast. For the more serious student, a section provides the derivation for 142 generic and 380 specific plant names.

FLOWERING SHRUBS. Zucker, Isabel. 380 pages, illustrated (part color), indexed. Van Nostrand Books, Princeton, N. J. 1966. $17.50.

The author lays before the gardener her lifetime experience with and knowledge of plants. She has grown in her own experimental garden the majority of the 579 (and 117 small trees to plant with them) shrubs which are discussed in this well-illustrated book. (The fine black and white photographs were taken by her husband Myron.)

The book is divided into: Part I, Using Shrubs; Part II, Growing Shrubs; Part III, Acquiring Shrubs; Part IV, Shrubs and Trees to Know and Grow.

Landscape architects and nurserymen will find *Flowering Shrubs* valuable as well as the home gardener. It can be highly recommended.

MISCELLANY

HERBS FOR EVERY GARDEN. Foster, Gertrude B. 255 pages, illustrated, indexed. E. P. Dutton & Co., Inc., New York, N. Y. 1966. $4.95.

Mrs. Foster knows herbs—their history, ancient beliefs about them, their uses past and present, and their culture. She grows herbs and makes use of them daily in her home. Her book reflects her knowledge of and enthusiasm for this interesting group of plants.

HORTULUS. Strabo, Walahfrid. (translated by Raef Payne) 91 pages, indexed, references. The Hunt Botanical Library, Pittsburgh, Penna. 1966. $12.00.

This new edition of *Hortulus,* attractively bound and illustrated by linoleum-cut decorations, is Volume 2 of the Hunt

Facsimile Series. The ninth-century manuscript, one of the earliest accounts of medieval gardening and plants, is reproduced for the first time through the cooperation of Bibliotica Apostolica Vaticana in Rome. The transcription and English translation by Raef Payne of Eton College appear on facing pages. The volume contains a biographical account of Strabo, a Benedictine monk, by Wilfrid Blount; a bibliographical study of previous editions; an account of the plants mentioned; and a list of references.

The Hunt Botanical Library is to be congratulated on this publication.

PLANT SOCIOLOGY. Braun-Blanquet, J. 439 pages, illustrated, indexed. Hafner Publishing Co., New York, N. Y. 1965 (rec'd. 1966). $8.00.

A facsimile of the 1932 edition which was translated, revised, and edited by George D. Fuller and Henry S. Conard.

LIFE OF MENDEL. Iltis, Hugo. 336 pages, illustrated, indexed. Hafner Publishing Co., New York, N. Y. 1966. $5.75.

The original was published in 1924 under the title *Gregor Johann Mendel, Leben, Werk,* and *Werking*. It was translated and published in English in 1932, of which the present is a second impression.

COMPANION PLANTS AND HOW TO USE THEM. Philbrick, Helen and Richard Gregg. 111 pages, indexed. The Devin-Adair Company, New York, N. Y. 1966. $3.75.

Sponsored by the Bro-Dynamic Farming and Gardening Association, Inc., this is the first popular book in English on plant symbiosis and plant antagonisms, based on the author's own research and experiments, for daily gardening and farming.

ABOUT PLANTS: TOPICS IN PLANT BIOLOGY. Steward, F. C. 174 pages, illustrated, indexed. Addison-Wesley Publishing Co., Inc., Reading, Mass. 1966. Paper $2.95.

One of the Addison-Wesley Series in the Principles of Biology, "this book is a modification of the companion volume entitled *Plants at Work* . . . with less emphasis on the more specialized aspects of biochemistry and cell physiology" and more emphasis on general biological material.

HURRY, SPRING! North, Sterling. 58 pages, illustrated. E. P. Dutton Co., New York, N. Y. 1966. $3.75.

Few contemporary writers have the scientific knowledge and the literary ability to capture the essence of spring—Sterling North is among the few. And his *Hurry, Spring* is enchanting. It will delight all ages, adult and youth, as will the exquisite drawings by Carl Burger.

AN ACCOUNT OF RHODODENDRON IN MALESIA. Sleumer, H. 674 pages, illustrated, indexed. P. Noordhoff Ltd., Groningen, The Netherlands. 1966. $8.50.

This is partly a reprint from *Flora Malesiana,* Series I, volume 6, part 4. It should appeal to rhododendron enthusiasts who are interested in knowing about species and forms of the genus, even though they may not be able to grow the montane-tropicals. Some, however, who have greenhouses may enjoy experimenting with them, and it is considered possible that they may be grown in Florida, California, and Hawaii.

THE GEOGRAPHY OF SOIL. Bunting, Brian T. 213 pages, charts, indexed. Aldine Publishing Co., Chicago, Ill. 1965. $5.00.

The main cases studied are based in North America, Australia, and Africa where Professor Prescott did most of his field work. Special attention is given to boundary evolution, the influence of boundaries on border landscapes, border disputes, and internal boundaries.

The Geography of Soil is a convenient reference for political, regional, and economic geographers, ecologists, agronomists, and conservationists.

ORIGINS OF AMERICAN CONSERVATION. Clepper, Henry (ed.). 193 pages, indexed. The Ronald Press Co., New York, N. Y. 1966. $4.50.

Henry Clepper, Executive Secretary of the Society of American Foresters and Managing Editor of *Journal of Forestry* for the past thirty years, was a wise choice as editor of this book which deals with the history and the background of the various conservation programs in America. Mr. Clepper has written the first chapter, "The Conservation Movement: Birth and Infancy," and the following chapters have been written by specialists in their particular fields—for example, "Wildlife Regulation and Restoration" by James B. Trefethin, "Soil Conservation" by H. Wayne Pritchard, "Parks and Wilderness" by Conrad L. Wirth.

AN INTRODUCTION TO NATURE. Kieran, John. 223 pages, illustrated (color), indexed. Doubleday & Co., New York, N. Y. 1966. $7.50.

The continued popularity of this book is evident from the fact that it was originally copyrighted and published in 1946, reprinted five times, and republished this year, with the copyright renewed. The full-color illustrations by three well-known artists, Don Eckelberry, Tabea Hofmann, and Michael H. Bevans, and John Kieran's enjoyable text make this a fine book for the amateur naturalist.

FERNS AND FERN ALLIES. Grillos, Steve J. 104 pages, illustrated. 1966. $1.50.

NATIVE SHRUBS OF SOUTHERN CALIFORNIA. Raven, Peter H. 132 pages, illustrated. 1966. $1.95.

NATIVE TREES OF SOUTHERN CALIFORNIA. Peterson, P. Victor. 136 pages, illustrated. 1966. $1.95.

NATURAL HISTORY OF SOUTHERN CALIFORNIA. Jaeger, Edmund C. and Arthur C. Smith. 104 pages. 1966. $1.95.

CACTI OF CALIFORNIA. Dawson, E. Yale. 64 pages, illustrated (part color). 1966. $1.50.

These five compact books, prepared by knowledgeable authors under Arthur C. Smith, General Editor of the California Natural History Guides, are informative and useful not only to Californians but to visitors to that state.

BIRDS OF NORTH AMERICA. Robbins, Chandler S., Bertel Brunn, and Herbert S. Zim. 340 pages, illustrated (color), indexed. Golden Press, Inc., New York, N. Y. 1966. $2.95 (paper).

An easy and accurate guide to the field identification of three groups of birds—breeding, regular visitors, casual visitors—which are likely to be found in North America north of Mexico.

An interesting feature is the introduction of "Sonagrams" for more than three hundred birds. This is a technique charting a "picture" of bird songs taken from field recordings.

THE BIRD TABLE BOOK. Soper, Tony. 139 pages, illustrated, indexed, appendices, bibliography. Taplinger Publishing Co., New York, N. Y. 1966. $4.50.

This unique guide to feeding birds in order to encourage them to visit the garden and window sill, which was published in Great Britain in 1965, is now available in this country.

The appendices furnish additional interesting data, including "Recipes," "Lifespans of Wild Birds," "Treatment of Casualties," and "Birdsong Recordings."

STUDIES IN LANDSCAPE DESIGN. Jellicoe, G. A. 112 pages, illustrated, indexed. Oxford University Press, New York. 1966. $8.00.

A collection of lectures prepared and delivered over the years by the author, a British architect and city planner. The lectures trace the development of man's interest in the shaping of the landscape, while trying to help the reader gain insight into the overall objectives of modern landscape design. Two chapters of particular interest to the gardener: "Italian Garden of the Renaissance," and "The Search for a Paradise Garden."

AN INEXPENSIVE PLANT SCIENCE LIBRARY

One of the more gratifying experiences which I have had at The Botanical Garden has been the realization that the nonbotanical public really wants to know more about the plants which they see and grow. In some cases, this takes the form of an interest in the names of plants—the subject of plant taxonomy. As the person becomes more involved in botany, questions arise on the structure and activities of plants—the interrelated topics of morphology and physiology.

I have frequently been asked, "What can I read?" There are, of course, many excellent textbooks and advanced monographs on different aspects of morphology and physiology. Unfortunately, many people have felt that they had "had" textbooks or that the cost of a hard-cover book was more than it was worth.

Happily, the paper-bound book revolution has finally involved the plant sciences, and a number of well-written paperbacks on botany now compete on bookstore

shelves with the more usual nude blond holding a smoking pistol. The following list of books on plant science may be of value to a person who with a little effort can acquire a very well-rounded botanical education. I suggest that you read the books in each category in the order given.

GENERAL BOTANY

Bold, H. C.: The Plant Kingdom. 2nd ed. Prentice Hall Publ. Co., Englewood Cliffs, N. J.

Bowen, H. J. M.: Introduction to Botany. Arco Publ. Co., N. Y.

PLANT STRUCTURE

Swanson, C. P.: The Cell. 2nd ed. Prentice Hall Publ. Co., Englewood Cliffs, N. J.

Jensen, W. A.: The Plant Cell. Wadsworth Publ. Co., Belmont, Calif.

Hurry, S. W.: The Microstructure of Cells. Houghton-Mifflin Co., Boston.

Doyle, W. T.: Non-Vascular Plants—Form and Function. Wadsworth Publishing Co., Belmont, Calif.

Salisbury, F. B. and R. V. Parks: Vascular Plants—Form and Function. Wadsworth Publishing Co., Belmont, Calif.

PLANT PHYSIOLOGY

Ray, P. M.: The Living Plant. Holt, Rinehart and Winston, N. Y.

Galston, A. W.: The Life of the Green Plant. 2nd ed. Prentice Hall, Englewood Cliffs, N. J.

Steward, F. C.: About Plants. Addison-Wesley Publ. Co., Reading, Mass.

Fogg, G. E.: The Growth of Plants. Penguin Books, Baltimore, Md.

Torrey, J. G.: Development in Flowering Plants. MacMillan & Co., N. Y.

Steward, F. C.: Plants at Work. Addison-Wesley Publ. Co., Reading, Mass.

Street, H.: Plant Metabolism. Pergamon Press, N. Y.

Rosenberg, J. L.: Photosynthesis. Holt, Rinehart & Winston, N. Y.

THE PLANT KINGDOM

Smith, K. M.: Viruses. Cambridge Univ. Press, N. Y.

Sussman, A. S.: Biology through Microbes. Univ. Michigan Press, Ann Arbor, Mich.

Sistrom, W. R.: Microbial Life. Holt, Rinehart & Winston, N. Y.

Large, E. C.: The Advances of the Fungi. Dover Publ. Co., N. Y.

Christensen, C. M.: The Molds and Man. Univ. Minnesota Press, Minneapolis.

Guberlet, M. L.: Seaweeds at Ebb Tide. Univ. Washington Press, Seattle.

Jacques, H. E.: Plant Families—How to Know Them. C. W. Brown and Co., Dubuque, Iowa.

ECOLOGY

Bates, M.: The Forest and the Sea. Random House, N. Y.

Clepper, H. and A. Meyer: World of the Forest. A. C. Heath Co., Boston.

Stoere, J. H.: The Web of Life. New American Library, N. Y.

Billings, W. D.: Plants and the Ecosystem. Wadsworth Publ. Co., Belmont, Calif.

Of course, there are many other paperbound books on genetics, evolution, biochemistry, and biophysics which are partly oriented towards plant science. Your bookseller can help you make selections.

New books are coming out all the time. The Houghton-Mifflin Co. of Boston is preparing a series of books coedited by Dr. Steere which will include volumes on the algae, fungi, mosses and ferns, fossil plants, and evolution. The same publisher will also have a series of books on plant physiological topics. These books will be published in 1967. The Natural History Press Division of Doubleday and Co. is preparing a series of books for the general public on all phases of botany. This series will also begin to appear in 1967.

RICHARD M. KLEIN

NEWS AND NOTES (Continued from page 253)

specimen. It makes a beautiful evergreen hedge the year around and is a most effective barrier to confine children and keep unwanted animals off the home property.

"A closely trimmed holly specimen on each side of the entrance steps gives dignity and distinction, and a larger planting in which holly is combined with rhododendrons and azaleas is handsome.

"Hollies do well in semishade," continued Mr. Bosley, 'but the foliage is more dense and the berries are more abundant in full sunshine. And they should not be planted too closely to other trees and shrubs whose roots will compete for nutrients and moisture in the soil. If the soil tends to be alkaline or neutral, the necessary acidity can be obtained by the application of iron sulphate at the rate of a handful to every nine square feet of soil area. The soil should be improved, when planting holly, with peat moss. Mr. Bosley advises soaking the peat moss thoroughly with water, and then combining topsoil and peat moss in equal parts to fill around the roots. Excessive watering is not recommended. Specimens should be well watered when they are planted and three or four times during their first growing season, if there is not sufficient rainfall.

"Where the soil composition is humusy for root growth and drainage is good, hollies do not require feeding the first year. However cow manure, if available, and/or cottonseed meal are beneficial for established plants.

"Since the staminate and pistillate flower parts are borne on separate plants, it is necessary to have at least one male plant to every eight female plants. Female plants will bear their attractive berries only if fertilized by pollen from a male plant."

Among the varieties of holly he has produced, Mr. Bosley considers 'Yule', 'Hedgeholly', and 'Christmas Carol', all female plants, and 'Santa Claus', a male plant, the most outstanding. At Rutgers—The State University, New Brunswick, New Jersey, 'Hedgeholly' is being used in its breeding program in an effort to combine the rich, glossy foliage of English holly with the cold-resistance of American holly.

Dr. William Kosar shows *Ilex crenata* 'High Light' at the National Arboretum to a visitor.

Ilex crenata 'High Light', registered with the Holly Society of America, as No. 2-64, has been distributed by the United States National Arboretum to cooperative arboretums and botanical gardens for testing. This clonal selection originated as a single branch mutation near the base of a ten-foot-high *I. crenata* 'Microphylla'. During the past ten years, the mutation has developed into a broad, conical-shaped plant, with a height of ten-feet and a spread of eight feet. The original plant is in the holly collection at the National Arboretum.

The distinguishing features of 'High Light' are the boxwood-like texture of the dark green leaves and the branching habit which creates highlights and shadows in the mature specimen. Since the twiggy branchlets produce a billowy effect in a mature plant, pruning or shearing is not recommended. *I. crenata* 'High Light' has survived temperatures as low as 2°F.

'High Light' is readily propagated by cuttings. Limited numbers of rooted cuttings will be distributed to arboretums and botanic gardens, experiment stations, and qualified nurserymen next spring — and eventually 'High Light' will be available to the home owner.

DATA PROCESSING (Continued from page 247)

The costs involved are relatively low, especially when you consider how many man-days would be required to extract these data manually. At present we are not being charged for services at the University of Tennessee Computing Center. This is largely due to National Science Foundation support received by this center (NSF-G13581). We also have access to and a cooperating agreement with the computing center at Oak Ridge National Laboratory.

Costs of equipment operation, however, at the U. T. Computing Center run in this range:

IBM 1620 computer system	$25 per hour
IBM 1401 computer system	$35 per hour
IBM 7040 computer system	$120 per hour

These charges may seem to be high, but the IBM 7040 can process and print (with three or more carbons) in four minutes what it might take one man a month to do.

Judging from the comments in the A.A.B.G.A. April, 1966, *Newsletter;* Tom D. Throckmorton's ideas and conclusions (presented at the Twentieth American Horticultural Congress at Pine Mountain, Georgia, and reprinted in the April, 1966, *American Horticultural Magazine*); as well as from my own personal observations, we need better methods of information retrieval. If such methods are not used, invaluable research data may be lost, never utilized, or never recorded at all! There is some urgency to this matter, since the data files grow daily.

I should like to suggest the formation of a committee to look into the feasibility of initiating an International Plant Records Compilation Center. Such a center would provide the services of information retrieval, with all of its ramifications, for cooperating arboreta and botanic gardens.

Mr. MacDonald has been appointed Chairman of the new committee of the International Association of Botanic Gardens to initiate an International Plant Records Center. The members of the committee are Dr. Richard A. Howard, The Arnold Arboretum, Jamaica Plain, Massachusetts; Dr. S. M. Walters, Curator of Herbarium, University of Cambridge, England; John S. L. Gilmour, Director of University Botanic Garden, Cambridge, England; Paul C. Hutchinson, University of California Botanic Garden, Berkeley, California; Dr. Lee W. Lenz, Rancho Santa Ana Botanic Garden, Claremont, California; Dr. William S. Stewart, Los Angeles State and County Arboretum, Arcadia, California; Dr. H. R. Fletcher, Regius Keeper, Royal Botanic Garden, Edinburgh; and Webster R. Crowley, Morton Arboretum, Lisle, Illinois. Dr. Howard has agreed to serve as the Funding Coordinator for the project.

In recent correspondence with Dr. H. R. Fletcher, President of this Association, Mr. MacDonald clarified some of the issues which were discussed during the XVII International Congress.

The proposed center, to be truly comprehensive, must be completely international in participation. Although initially it is limited to English-speaking countries, this factor must be of short duration. As stated under "The XVII International Horticultural Congress," reported elsewhere in these pages, a pilot project will be undertaken to provide a base on which to extrapolate cost figures and iron out problem areas, as well as to provide a working base upon which support may be sought from a foundation. The American Association of Botanic Gardens and Arboreta has assumed the sponsorship of this pilot project.

The distribution and utilization of the data will be formulated by the steering committee for the center, in accordance with the desires of cooperating institutions.

The initial recording of data will require mobile units containing keypunch and other attendant apparatus. The use of mobile units with trained personnel will result in more efficient and (perhaps) more accurate recording of data than if local facilities (if available) were utilized.

A standardized input format (accession) card must be developed. All interested and/or participating institutions should send samples of accession cards (and other pertinent forms) to the project chairman, (Robert MacDonald), immediately. Once the initial data have been recorded, subsequent information will be fed to the Center systematically on the standard input form.

The output data will be made available in whatever format desired (within Center capabilities) to the cooperating institutions. This may range from printed manuscripts to file cards or duplicate tapes or disk packs; the latter two may then be utilized at either local computer or EDP facilities.

INTERNATIONAL CONGRESS (from page 245)
[his] efforts in building the Norfolk Botanical Garden and improving the parks of Norfolk . . ."; to Oscar M. Kirsch of Honolulu, Hawaii, for his "work in hybridizing and growing orchids . . ."; to Alfred M. S. Pridham, of Ithaca, New York, for his "life work in floriculture and horticulture. [His] investigations, [his] teaching and extension activities throughout New York State have aided thousands in increasing their knowledge of plants . . ."

A film on the golden jubilee of the National Botanic Gardens of South Africa at Kirstenbosch, and the meetings and botanical tour celebrating the event in which fifty botanists from twenty-one countries participated, was shown by Prof. Rycroft, the Garden's Director. Prof. Rycroft added apropos remarks, and there were many in his audience who entertained the hope of some day viewing the scenes with their own eyes.

LETTERS TO THE EDITOR

. . ., I was delighted to see the article in the May-June issue entitled "The Silver Slipper Orchid of Bergen Swamp." I visited the swamp—its chief interest for me is its bog—on June 30 with a graduate student who is doing research on the flora there. Although we didn't find the silver slipper orchid, we found a number of other rare bog plants. The day was a delightful one, and I was able to bring back some very fine color transparencies as a record of our tramp. It was a great pleasure, therefore, to relive the day by reading the article on the silver slipper orchid in your magazine.

RICHARD B. FISCHER, *Professor*
Nature and Conservation Education
Cornell University

NEW MEMBERS

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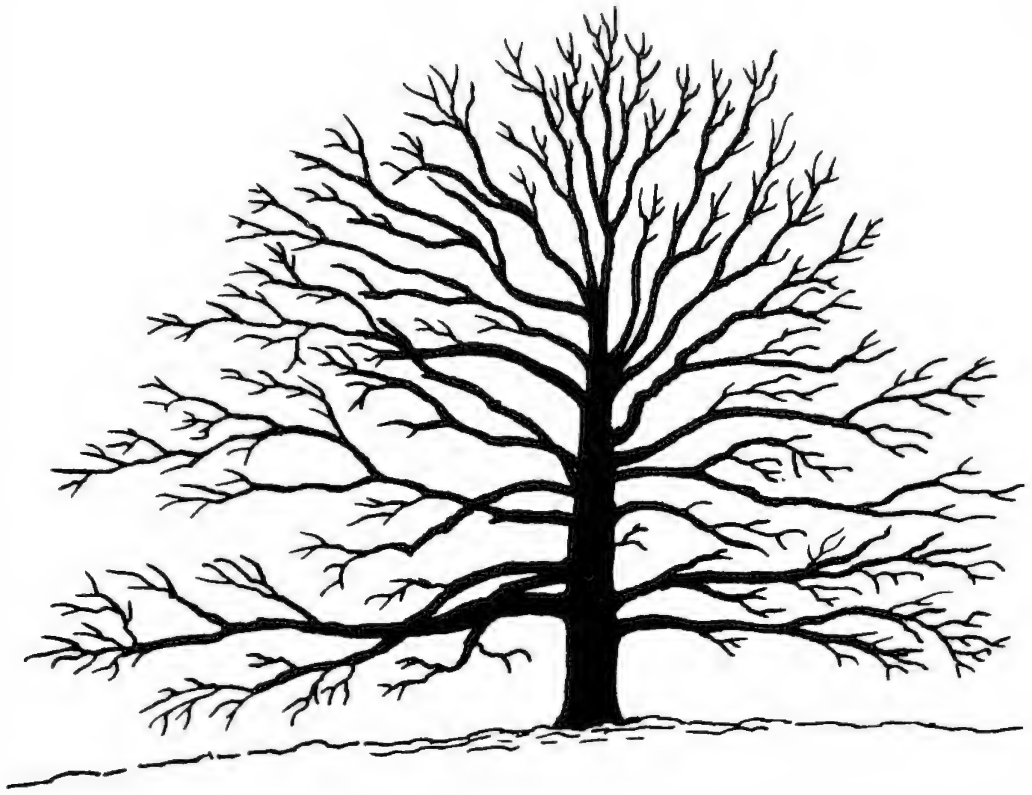

THE OAK ON A WINTER'S DAY

IT STANDS in its strength, revealed in its power—the oak on a winter's day. Each tree at this season shows its true form and character; each species thus is distinctive because of its manner of branching and growth. As at no other time, the trees appear as they developed—splendid woody structures built with botanic engineering which keeps them upright, impervious to most storms, able to live longer lives than most other plants.

The leaves which had their vital part to play in keeping the tree alive with food have served their purpose for this year and have fallen to the ground—leaves which are broomed about by winds, dampened down by rains, and softened, decayed, and assimilated into the earth at last. Around the tree is created a rich, thick humus which is full of minerals to aid in the welfare both of the tree and the other plants growing there, and directly influencing the animal populations as well.

Wrapped in bark which is a necessary insulation, the trunk holds its inner mechanism intact. The tree is dormant until springtime starts the sap to moving, sends it up into the smallest twigs to trigger enzymes in the winter buds and bring forth leaves and flowers.

The strength, shape, and longevity of a tree are not achieved by chance. They are the result of millions of years of plant evolution, of trial and error—trials which, if they turned out to be errors, caused extinction in forms unfitted to survive in today's world. With annual problems of temperature, ranging from thirty degrees below zero to well above a hundred, and with a massive, upright form which must withstand the twisting of winds and the drying of sun and air, the tree today is a marvelous plant. And in winter it shows its true self.

Abraham Lincoln expressed admiration for trees in winter when he said: "I like trees best when they're not in leaf and you can study their anatomy. Look at the delicate firm outline of that leafless tree against the sky. And here's the profile of the tree in its shadow on the snow."

Excerpts from *The Living Museum,*
Vol. XXVI, No. 7, November, 1964.

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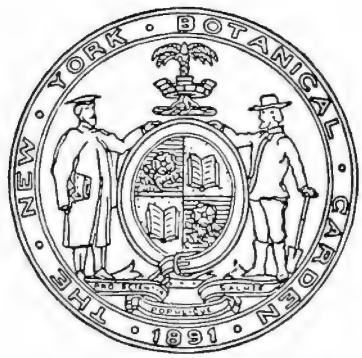
DOROTHY EBEL HANSELL

Editor



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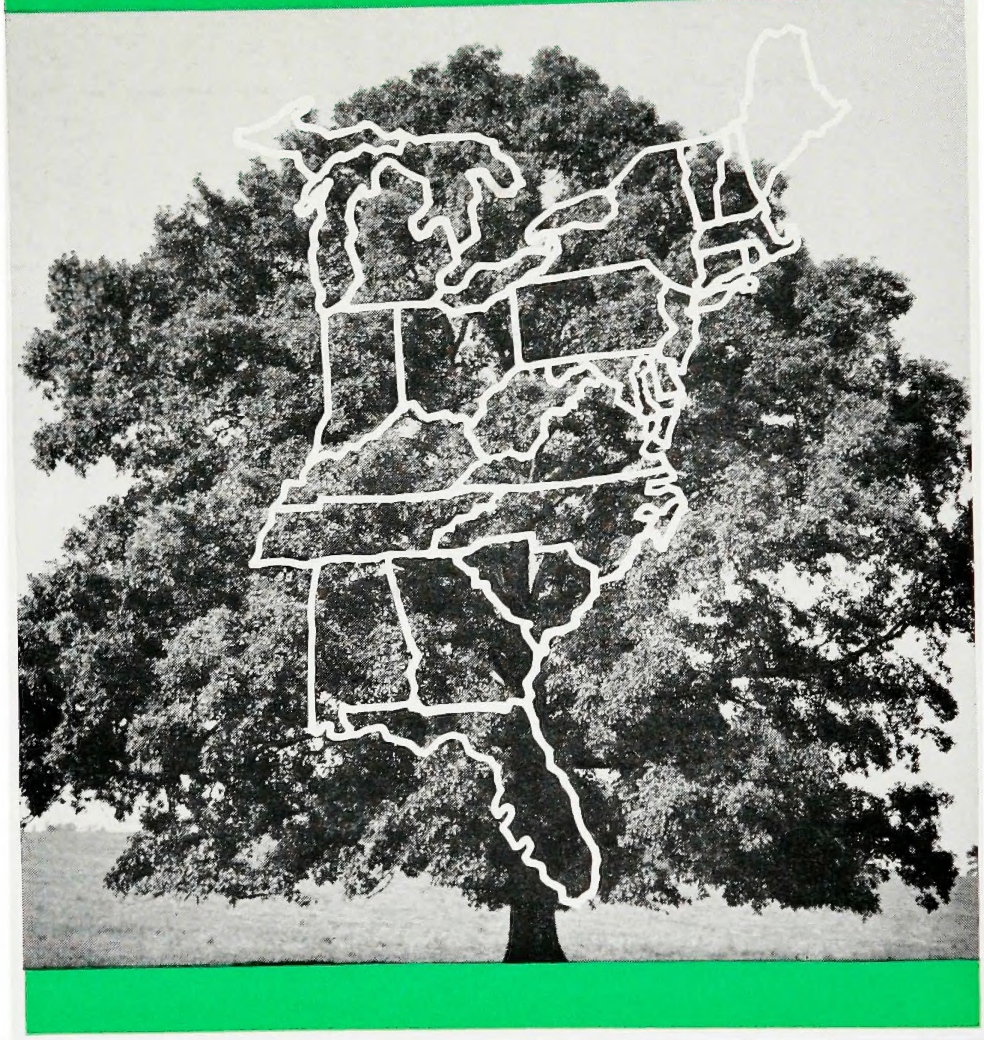

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